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PSYCHOLOGICAL REVIEW COMPANY
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Vol. 27, No. 2 February, 1930

THE
PSYCHOLOGICAL BULLETIN

REPORT OF THE SECRETARY OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION

BY CARL C. BRIGHAM
Princeton University

At the annual business meeting of the American Psychological Association, Inc., held in New York City on December 27, 1928, the following motion was adopted: On the recommendation of the Council of Directors, inasmuch as the American Psychological Association has voted to omit the annual business meeting in 1929, those portions of the By-Laws relative to the annual meeting be suspended for the year 1929 and that the Council of Directors be empowered to proceed with the election of new Members and Associates; in passing the budget for 1930, in making the arrangements for the 1930 meeting of the Association, with receiving reports of committees and with any other routine business of the Association which may come before it and that the minutes of this meeting shall be published as usual in lieu of the Proceedings of the annual meeting.

In accordance with this motion, a meeting of the Council of Directors was held on September 7, 1929, in Room 33, Kent Hall, Yale University, New Haven, Connecticut, at 2:15 P.M. Present were the President, the Secretary, the Treasurer, and Professors Allport, Dallenbach, Miles, Peterson, Weiss, and Woodrow.

Upon a motion duly made and seconded, it was voted that the minutes of the meeting of the Council of Directors held in New York, N. Y., on December 26, 1928, be approved.

Upon a motion duly made and seconded, it was voted that the minutes of the Thirty-Seventh Annual Meeting at New York, N. Y., be approved as printed.

The Council of Directors received the informal report of the Business Manager of the Psychological Review Company, including a financial report of the receipts and expenditures of the company from December 1, 1928, through August 31, 1929.

Upon a motion duly made and seconded, the Secretary was authorized to secure legal advice for the Council in reference to the dissolving of the Psychological Review Company, the expenditures for such legal advice not to exceed the sum of two hundred dollars.

Upon a motion duly made and seconded, it was voted that in view of the rapid increase in size of the American Psychological Association, Inc., a committee be appointed by the President to consider recommendations for the more effective management of the business affairs of the Association. The President appointed the Secretary, the Treasurer, and the Business Manager of the Psychological Review Company.

The Council of Directors received the report of the Editorial Board of the Psychological Review Company presenting the following recommendation: "That the Psychological Index be continued at least a year longer."

Upon a motion duly made and seconded, it was unanimously voted that the Psychological Index be not discontinued.

The following communication having been received from the Editorial Board of the Psychological Review Company, "That a 'classified author index' be included in No. 13 of the current volume of the Abstracts and that if this prove an acceptable substitute for the Psychological Index, the latter be forthwith discontinued," and the Council of Directors not finding itself in sympathy with this recommendation, upon a motion duly made and seconded, it was voted that no added funds be appropriated for the proposed classified author index of the Psychological Abstracts.

Upon a motion duly made and seconded, it was voted to accept the report of the Editor of the Psychological Abstracts consisting of a financial statement of the receipts and expenditures of the Business Office of the Psychological Abstracts from January 1, 1928, to December 31, 1928, audited and found correct by H. C. Warren and E. G. Wever on January 31, 1929, and a statement of the receipts and expenditures of the Editorial office of the Psychological Abstracts from January 1, 1928, to December 31, 1928, audited and found correct by J. P. Nafe and V. Jones on February 3, 1929.

Upon a motion duly made and seconded, it was voted to ratify

the previous mail vote of the Council nominating F. L. Wells to the Executive Committee of the Committee on Organization of the First International Congress on Mental Hygiene.

Upon a motion duly made and seconded, it was voted to ratify the nomination by the President of Professor H. A. Carr to represent the Association on the National Research Council's Advisory Committee to the Chicago Centennial Association to prepare plans for the Exposition in 1933.

The Secretary, with deep regret, announced the death of Edgar Pierce on February 15, 1929, of Edward F. Buchner on August 22, 1929, and of Morton Prince on August 31, 1929.

The Council received an informal report of the Treasurer for the period December 15, 1928, to September 3, 1929.

Upon a motion duly made and seconded, it was voted to accept with deep appreciation expressed on behalf of the American Psychological Association, Professor Howard C. Warren's generous gift of sixty shares of stock in the Psychological Review Company.

Upon a motion duly made and seconded, it was voted that the next annual meeting of the American Psychological Association, Inc., be held at the State University of Iowa, Iowa City, Iowa, on December 29, 30, and 31, 1930.

Upon a motion duly made and seconded, Professor C. E. Seashore was elected a member of the Executive Committee for 1930.

Upon a motion duly made and seconded, Professors Buford Johnson and S. W. Fernberger were elected members of the Program Committee for 1930.

Upon a motion duly made and seconded, Professors R. P. Angier and G. F. Arps were elected as representatives of the American Psychological Association, Inc., on the Council of the American Association for the Advancement of Science for the term 1930–31.

Upon a motion duly made and seconded, the following budget was adopted for the year 1930:

AMERICAN PSYCHOLOGICAL ASSOCIATION, INC.

BUDGET FOR 1930

Printing and supplies	$500.00
Postage and express	400.00
Reprints	200.00
Year Book	600.00
Proceedings (Abstracts)	400.00
Incidentals, 1930 meeting	60.00
Apparatus exhibit	50.00
Treasurer's bond and safety deposit box	12.50
Committee on Animal Experimentation	50.00
Subscriptions to Psychological Abstracts	3,300.00
Lawyer's fees	200.00
Secretary's stipend	1,000.00
Treasurer's stipend	100.00
	$6,872.50

Upon a motion duly made and seconded, it was voted to extend to Yale University, on behalf of the American Psychological Association, an expression of its appreciation of the entertainment extended to foreign and American psychologists at the Ninth International Congress of Psychology.

Upon a motion duly made and seconded, the following Associate Members were transferred to Membership in the American Psychological Association, Inc.:

1. Luton Ackerson
2. Arthur G. Bills
3. Sheldon Glueck
4. John A. McGeoch
5. Samuel Renshaw

Upon a motion duly made and seconded, the following was elected to Membership in the American Psychological Association, Inc.:

1. Hudson Hoagland

Upon a motion duly made and seconded, the following were elected to Associate Membership in the American Psychological Association, Inc.:

1. Frederick J. Adams
2. James B. Anderson
3. Eston J. Asher
4. Robert C. Astrop
5. Ernst A. Atkinson
6. Harriet S. Babcock
7. Josephine Ball
8. Key L. Barkley

9. Sarah J. Bassett
10. Arthur K. Beik
11. Hugh McK. Bell
12. Irving E. Bender
13. Robert G. Bernreuter
14. John E. Bohan
15. Marian Braungard
16. Cecil R. Brolyer
17. William A. Brownell
18. Mildred E. Burlingame
19. Norman Cameron
20. Burton M. Castner
21. Dwight Chapman, Jr.
22. Matthew N. Chappell
23. Florence M. Chitester
24. Siegen K. Chou
25. Glen U. Cleeton
26. Louis H. Cohen
27. Stephen M. Corey
28. James D. Coronios
29. George W. Crane
30. Albert B. Crawford
31. Mason N. Crook
32. William J. Crozier
33. Hazel M. Cushing
34. Frances C. Cutujian
35. Bonnye E. Deal
36. Henry N. De Wick
37. Elmer F. Diggins
38. Wilma T. Donahue
39. Mary L. Dougherty
40. Oscar Berry Douglas
41. Lewis E. Drake
42. Daniel D. Droba
43. Clifford F. Duncan
44. Howard Easley
45. Harold A. Edgerton
46. Merle H. Elliott
47. Alvin C. Eurich
48. P. Harry Ewert
49. Leo B. Fagan
50. Warren G. Findley
51. Audrey M. S. Firkins
52. Adelbert Ford
53. Clarence C. Fowerbaugh
54. Edward E. Franklin
55. Graydon La V. Freeman
56. Helen M. Gardner
57. Harold V. Gaskill
58. Louis W. Gellermann
59. Minnie Giesecke
60. Etta C. Gillman
61. Clarence H. Graham
62. Virginia T. Graham
63. Edward B. Greene
64. Pearl F. Gridley
65. Ella M. Hanawalt
66. Luberta M. Harden
67. Genevieve L. Harter
68. Richard S. Harter
69. Ingvald B. Hauge
70. Seth E. Haven
71. Joseph W. Hawthorne
72. Thomas A. Hendricks
73. R. Yorke Herren
74. Lovic B. Herrington
75. Ernest R. Hilgard
76. Richard S. Hill
77. Ching-Ju Ho
78. Rex Livingston Hoke
79. S. Daniel House
80. Thomas H. Howells
81. I. Huang
82. Doncaster G. Humm
83. Harry F. Israel
84. John M. Jacobsen
85. William T. James
86. Arthur F. Jenness
87. Dorothea E. Johannsen
88. Granville B. Johnson
89. Florence Justin
90. Lotta M. Karpeles

91. Daniel Katz
92. Louis W. Keeler
93. E. Lowell Kelly
94. Agnes T. Landis
95. Delia L. Larson
96. Daniel B. Leary
97. Mary A. M. Lee
98. Robert W. Leeper
99. Chester E. Leese
100. Harvey C. Lehman
101. Vernon W. Lemmon
102. Olive P. Lester
103. Clarence J. Leuba
104. David M. Levy
105. George A. Lewis
106. Kate Lewis
107. Rensis Likert
108. Edward A. Lincoln
109. Erich Lindemann
110. John A. Long
111. Howard P. Longstaff
112. Elizabeth E. Lord
113. Roger B. Loucks
114. Inez V. Love
115. Clyde A. Lynch
116. Norman R. F. Maier
117. Edith B. Mallory
118. Carlyn J. Manasses
119. Anna Rachel Markt
120. Dorothea M. Marston
121. Paul E. Martin
122. Kathryn E. Maxfield
123. Barbara A. Mayer
124. John H. McFadden
125. John M. McGinnis
126. Roland C. McKee
127. Clarence L. McKelvie
128. Charles B. McMullin
129. Quinn McNemar
130. William H. Mikesell
131. Lawrence W. Miller
132. Vernon L. Miller
133. Alexander Mintz
134. Grace Moore
135. Herbert Moore
136. Elizabeth H. Morris
137. Emiline R. Moul
138. Alfred D. Mueller
139. Karl F. Muenzinger
140. Norman L. Munn
141. Joseph W. Nagge
142. Bert Allen Nash
143. Amalie K. Nelson
144. Victor H. Noll
145. Kermit W. Oberlin
146. Richard A. C. Oliver
147. Katharine T. Omwake
148. Sinforoso G. Padilla
149. Richard M. Page
150. Gladys E. Palmer
151. Emily Patterson
152. Gaige B. Paulsen
153. Helen Peak
154. Glenn R. Pease
155. Laurence A. Petran
156. Mary L. Phares
157. Helen J. Reed
158. William P. Reed
159. James A. W. Reeves
160. Martha M. Reynolds
161. William W. Rogers
162. Dorothy Rowell
163. Beatrice R. Rubin
164. Phillip J. Rulon
165. Edward A. Rundquist
166. Metta M. Rust
167. Maxwell L. Sacks
168. Matthew M. R. Schneck
169. Theodore C. Schneirla
170. Gregory J. Schramm
171. Adelin W. Scott
172. Louise C. Seibert

173. Lowell S. Selling
174. Georgene H. Seward
175. Clarence H. Smeltzer
176. Geraldine F. Smith-Seiler
177. Randolph B. Smith
178. Donald S. Snedden
179. Alto L. Snell
180. Herbert Sorenson
181. Earl B. South
182. Ethel St. Clair
183. Elizabeth M. Stern
184. Mabel E. Stewart
185. Stuart M. Stoke
186. Robert Stone
187. Francis C. Sumner
188. Charles W. Telford
189. F. L. Templeton
190. Wellington A. Thalman
191. Lorin A. Thompson, Jr.
192. Ruth H. Thomson
193. Burton D. Thuma
194. Samuel Tomkinson
195. Charles K. Trueblood
196. Austin H. Turney
197. David Turteltaub
198. Eliza Ruth Valentine
199. Dorothy Van Alstyne
200. William L. Van Buskirk
201. Noel B. Van Wagenen
202. Walter C. Varnum
203. L. N. Vernon
204. Katherine Vickery
205. John Volkmann
206. Thelma Grady Voorhis
207. Ruth W. Washburn
208. George E. Weigand
209. James D. Weinland
210. Persis E. White
211. Carroll A. Whitmer
212. Lester E. Wiley
213. Gertha Williams
214. Edmund G. Williamson
215. Erich C. Wohlfahrt
216. Cary C. Wood
217. Horace G. Wyatt
218. Joseph G. Yoshioka
219. Clarence W. Young
220. Robert A. Young
221. Kwang S. Yum
222. Thornton W. Zeigler

The meeting adjourned at 11:30 P.M.

Supplementary Report of Business Transacted by the Council of Directors, Sept. 9 to Dec. 31, 1929

The Council of Directors received and voted to accept the report of the Business Manager of the Psychological Review Company showing all receipts and expenditures from December 1, 1928, to November 30, 1929, and ordered the report to be filed with the Secretary.

The Council of Directors received and voted to accept the report of receipts and expenditures of the *Journal of Abnormal and Social Psychology* from April 1, 1929, to November 30, 1929, and ordered the report to be filed with the Secretary.

The Secretary reported to the Council of Directors the resignations of J. W. Barton, D. P. MacMillan, G. E. O'Brien, H. V. Race, A. A. Roback, J. E. Russell, F. C. Sharp, W. T. Shepherd, R. B. Teachout, F. Thilly, and L. A. Weigle.

The Council of Directors received the report of the Committee on the Election of Officers as follows:

President for 1930: Herbert S. Langfeld.

Directors, 1930–1932: John F. Dashiell and Arnold Gesell.

Nominees for appointment to the Division of Anthropology and Psychology of the National Research Council, 1930–1932: A. T. Poffenberger and Calvin P. Stone.

Representative on the Social Science Research Council, 1930–1932: John E. Anderson.

The Council of Directors received and accepted the report of the Treasurer for the year 1929 as printed below:

AMERICAN PSYCHOLOGICAL ASSOCIATION, INC.

REPORT OF THE TREASURER FOR THE YEAR 1929

Dr.

To Balance from previous year	$6,827.29	
Dues received from members	8,881.55	
Sale of Monographs	6.90	
Sale of Year Books	34.25	
Sale of used equipment	25.00	
Interest	67.94	
Total		$15,842.93

Cr.

To Printing and supplies	$375.68	
Postage and express	115.32	
Reprints	76.28	
Year Books	413.76	
Proceedings (Abstracts)	86.69	
Incidentals, 1928 meeting	45.00	
Treasurer's bond and safety deposit box	12.50	
Payment on Review Publications	1,000.00	
Interest on notes, Review Publications, 1929	150.00	
Refund of certification fees	35.00	
Committee on Social Science	10.52	
Subscription to Psychological Abstracts	2,385.00	
Secretary's stipend	1,000.00	
Treasurer's stipend	100.00	
Total		5,805.75
Balance on hand		$10,037.18

EDWARD S. ROBINSON,
Treasurer

Audited and found correct by
CLARK L. HULL and
S. M. NEWHALL

THE DIMMING EFFECT

BY THEODORE KARWOSKI[1]
Harvard University

The "dimming effect" is a relatively unfamiliar phenomenon to psychologists and even to many students of the problems of vision. For this reason it seems desirable to direct especial attention to it, and to give a brief account of the history of its investigation.

The dimming effect has been described in standard experimental textbooks and has been casually referred to in the general discussions of visual theory. Titchener (16, 45) included the dimming effect under the caption, "Observation of the negative after-image with the persistence of the stimulus." Sanford (9, 113) discussed it under the topic, "After-images upon a background faintly tinged with the stimulating color." These authors stated that the effect is complementary to the hue of the pre-dimming color.

Ladd-Franklin (10, 485) offers the following experiment from Hering as a striking illustration of the dimming effect: "Put a bright red paper box, held vertically in the hand, in such a way that a strong light falls upon the paper. After a few moments' fixation, turn around; the paper will now be shadowed by the walls of the box and the difference in illumination is enough to cause the paper to be spread over with a bright layer of the complementary color. That is, the after-image of the first bright impression is strong enough to blot out completely the actual red paper, although it is still looked at with open eyes, and in a not too faint illumination." Criticizing the Helmholtz theory of after-images which are conceived of as responses of the relatively unfatigued retinal excitation processes to the self light of the retina, enhanced by illusions of judgment, Ladd-Franklin (11, 398f.) says: "There is a simple experiment of Hering's, also, which ought to become classical, in which the amount of after-effect is shown in a way which cannot be improved upon: one has only to look fixedly upon a patch of color illuminated by the light of a lamp, when the patch, still looked at with open eyes, will appear to be spread over with the complementary color. This shows without question that the after-effect is of very

[1] Fellow of the National Research Council.

considerable intensity, and that some very pronounced physiological process is taking place in the retina."

An instance which shows how slight the changes of conditions may be to elicit the dimming effect is cited by Edridge-Green (**4**, xiv): "A vivid blue-green after-image may be seen not only in the absence of all green lights but whilst the eye is still being stimulated by a red light. If in a dark room in which all extraneous light has been excluded an incandescent light be covered by a deep red glass and a purple glass combined the only light transmitted will be a red light in the neighborhood of the A line. If the filament of the light be attentively regarded for twenty seconds and then the eye be slightly moved a bright blue-green after-image will be momentarily seen though the eye is still stimulated by red light."

Ebbinghaus (**3**, 238) gave the following description: "Suppose one fixates for a time a red slide on a yellow ground, and then reduces the objective light intensity of both colors by holding opaque cards in front of the window side of the room or reducing the light of the lamp. Fixation should be kept constant. One then perceives through the shadows, as if it were under-illuminated, an experience of great beauty—a green film on a blue ground. One has the impression as if with every excitation in the eye of a certain color sensation, there accompanies, at the same time, an active production of the complementary color. As long as the stimulus endures in its original intensity, this accompanying effect gradually increases, and more and more reduces and finally neutralizes the original sensation: this is adaptation. When the stimulation is neutralized or merely sufficiently reduced in intensity, the complementary color, meanwhile collected, so to say, steps forth clearly and completely, and this is the negative after-image."

In 1854, Scoresby (**15**, 546) reported the following observations in viewing spectral lights: "Sometimes the smallest change in the light was found to alter greatly the character of the spectrum. In certain cases the compressing of the eyelids, or the mere passing of the hands between the eyes and the light, could serve to change the negative pictures, or colors as viewed in the usual way, into their complementary tints." What seems to be an early reference to the dimming effect is that of Lehot (**12**), who in 1830 directed special attention to the color phenomena produced by suddenly varying the distance of the colored field.

Investigators have frequently applied the dimming effect procedure in order to isolate some particular aspect of visual experience.

McDougall (9, 379) sought to prove that yellow is a complex color containing red and green components: "On diminishing the illumination of a patch of Y after fixating it for thirty seconds or more, it usually becomes R unless the period of fixation has been considerably prolonged, when it usually becomes B." Hauer (7, 648) dimmed white light and observed an effect which matched a spectral light of 460$\mu\mu$. This bluish phenomenon was attributed to the natural light of the rods as a consequence of the reduction of the intensity of the stimulus below the cone threshold. Forbes (5) suggests a method for standardizing white light by checking for chromatism upon dimming.

To Hering (8, 132, 40) the dimming effect was merely a temporary reversal of the state of the dissimilative and assimilative processes of the retina. As such he considered it to be a pretty demonstration of the fundamental bases of his theory of vision. Although Hering never felt that the dimming effect is a phenomenon essentially different from the ordinary complementary after-image, he was interested in the richly saturated color effects so readily produced by this method. Some of the most striking ways of demonstrating the effects were first reported by Hering. If Hering did not see any difficulty in incorporating the dimming effect in terms of his theory of vision, he considered it quite unexplainable by the Young-Helmholtz postulates. Indeed, his most important arguments against the Young-Helmholtz theory of simultaneous contrast utilize the principle of the dimming effect. To Hering's last attempt at determining the contrast or antagonistic colors of visual experience, we probably owe the introduction of the dimming effect as a method of experimental procedure. The determination of such colors was intended to establish the simple color sensations of vision.

Hering's use of the dimming effect as a methodological instrument is shown in the work of Dittler and Satake (1, 240). This investigation was performed under the direction of Hering, who wrote the introduction to the paper. The work illustrates the delicacy of the dimming effect when applied as a means of measuring the accuracy of mixing colors to produce white. Since it is one of the first carefully conducted researches utilizing the dimming effect, it is appropriate to report this paper in detail.

Students of vision know that Hering has always insisted on maintaining a distinction between complementary and antagonistic colors. Originally, Hering used the term complementary only with reference to the Young-Helmholtz theory or theories of similar kind. Thus,

"mixed lights appear colorless when they act on the blue-yellow or the red-green substance, with equal dissimilative and assimilative power, for then both effects neutralize each other, and the action of the white-black substance alone remains. For this reason, two objective kinds of light, which give white when mixed, are not complementary but antagonistic; they do not produce white by combinations, but merely destroy each other and leave visible the white which was already there."

In the introduction to the Dittler and Satake paper, Hering distinguishes between the complementary and antagonistic (*Gegenfarbigen*) colors in this manner: "One determines complementary colors by equating an apparent white (that is, the white may merely appear to be white) and the white caused by two different wave lengths. These two wave lengths are complementary to the composite color but they are not necessarily antagonistic colors because, according to the theory (Hering), two homogeneous lights are only *Gegenfarbig* stimluant values, if when mixed in proper proportions they give a white to the CHROMATICALLY NEUTRAL EYE. In a room illuminated by daylight, the eye is always chromatically out of tune, because the daylight which reaches the visual epithelium possesses, besides the white stimulant value, also a colored one. That we always see white in natural or artificial illumination depends upon the fact that the eye can adapt itself to any kind of general illumination—not only brightness but color-toned illumination as well. Therefore, white things, in spite of the existing color disharmony within the eye, always appear white. If one shuts out the said light from the retina, after-images of previous illumination disappear and finally the visual field is seen as *Eigenlicht*. Then the eye is chromatically neutral but more sensitive to white. If now a white light impinges upon the retina which possesses besides a white a small color value—the color component may be so small as to be unnoticeable—and if one fixates an illuminated field in such a light for a long time and then suddenly reduces the intensity of the light, the chromatic disharmony betrays itself, because the colored stimulus value it contains shows a definite hue which is the *Gegenfarbe* of the color corresponding to the stimulus value of the subdued light stimulus."

Hering proceeded to say that by this method of dimming lights it is possible to discover mixtures of white which will show no noticeable chroma upon dimming, and thus the simple *Gegenfarben* as well as the complementary acting lights of daylight equations may be determined. "As there are numerous instances of literature on

complementary or homogeneous lights which in proper mixture give equations with daylight, gas, or electric light, and since the homogeneous lights of the *Gegenfarbig* effect, apart from my occasional observations, have never been directly determined, I have induced Messrs. Dittler and Satake to determine a series of lights affecting the eye in a *Gegenfarbig* manner, according to the theory above outlined."

Dittler and Satake determined the *Gegenfarbigen* wave-lengths. Then used a small telescope, the visual field of which could be flooded with light. This field of light, or sections of it, could be darkened by blinds pushed into the ocular. A fixation point was maintained in the center of the field. The stimulus fell on the extra-macular region of the retina, because foveal stimulation was prevented by a dark disk. The retinal image was 2 mm. in diameter. The inner margin of the semi-circular stimulus was 1 mm. from the center of the fovea. The experimenters used eleven binary light mixtures, of which the long wave-components were between 665$\mu\mu$ and 566.2$\mu\mu$. The use of lights outside of these limits proved unsafe, since the extreme limits of the spectrum would be involved. In the search for the *Gegenfarben* the experimenters always started with the long wave-lengths, which were kept at constant brightness, while they searched for the suitable short wave-length in respect to wave-length and brightness. When wave-lengths were found so that they mixed to give a white, to the dark-adapted eye, they were checked to discover whether they are really tone free by dimming the mixture after pre-exposure to the retina for thirty seconds. Testing mixtures was continued until tone-free, or rather relatively tone-free, effects were obtained. The contrast effect on dimming readily indicated the direction in which improvement could be made.

These investigators modified the above experiment in order to determine the complementary wave-lengths, as defined by Hering, for the same long wave-lengths used in determining the *Gegenfarben*. This was accomplished by flooding the unused half of the telescopic field with daylight and matching it with the already determined binary mixtures that were found to be tone-free. It was found that the two did not match. Daylight contained a decided yellow valency—so much so, that the already determined binary tone-free mixture seemed decidedly bluish by contrast with daylight. The experimenters proceeded to find a match by varying the short wave-length in respect to wave-length and brightness while the long wave component was maintained as a constant. When a match was established, the short

wave-length was noted and it determined the complementary color for the particular long wave-length used.

An important difficulty with this experiment is the fact that the values given for the *Gegenfarbig* effect are relative values. Actually, Dittler and Satake never found absolutely toneless results upon dimming. "A certain difficulty grew out of the search for *Gegenfarbigen* lights, according to the contrast (dimming) method, out of the fact that even with the most favorable choice of both lights a weak BLUISHNESS *remains*. But this bluishness was not comparable in intensity to that which was the result when we filled the aperture with daylight and dimmed after the same period of fixation. Why it was not possible in these questionable cases to eliminate the last amount of weak blue from the field of vision we have not been able to determine." This difficulty would not be anticipated by the fundamental laws of color mixture, since it has been generally held that proportional increase or decrease of each component in the mixture does not destroy the match.

The attempt of Dittler and Satake to determine the Hering *Urfarben* by the dimming effect method has been recently renewed by Schubert (**14**). This research was particularly concerned with the problem of the Urrot and the Urgrün. The failure of these primary colors to be complementary has been considered a serious objection to the Hering conception of color vision. Now Schubert finds that the Urrot and Urgrün are in fact complementary to a chromatically neutral and foveally stimulated retina. This is experimentally demonstrated by producing a white upon mixing the previously determined Urgrün, 503$\mu\mu$, and Urrot, 670$\mu\mu$ plus 451$\mu\mu$. Moreover, this white does not betray a chromatic valence upon dimming. Schubert attempts to explain the failure of previous workers to obtain a white, on the grounds that the reported yellow is due to the chromatic effects caused by the adaptation of the eye to the chromatic elements inherent in the general illumination.

With reference to the dimming effect as a phenomenon of vision, it is interesting to note that under similar conditions of experimentation Dittler and Satake have reported bluish effects, whereas Schubert was able to find complementary colors that failed to reveal a chroma when their mixture was dimmed. Schubert seems to take it for granted that Dittler and Satake allowed a yellow-green valence to enter into their experiments, which is hardly justifiable, since their experiment was meticulously prepared to rule out the effects of previous retinal stimulation by the general light. However, it is not

clear whether Schubert is positive that no chromatic effects were experienced upon dimming white because he mentions that "it is often difficult to distinguish darkness from blueness" (page 92). A more sudden method of dimming than that used by Schubert might have brought out the chroma more clearly.

Unlike Hering, Troland (17, 84–88) is inclined to believe that the phenomenal aspect of the effect is difficult in explanation and so worthy of study. Troland worked with spectral lights and automatically reduced the intensity of a foveal stimulus by means of an electrical device. Eight spectral lights were investigated. Two trials were made for each eye with preëxposure time of 32 sec. The lights had an approximately equal primary brightness of about 800 photons. The dimming was approximately 10 per cent. Three observers were in agreement with regard to the nature of the dimming contrast effect. "The exact color which appears with dimming depends upon the degree of adaptation and the amount of dimming, these two being more or less interchangeable. Thus with the standard red slight dimming gives a violet; then follow: purple, blue, greenish blue, and blue green, as the extent of dimming or adaptation is increased. The dimming colors observed for the eight standard spectral lights employed in the experiments described in this monograph were as follows: red, blue or purple; yellow, reddish; yellow-green, faintly violet-blue; blue-green, dark blue; blue, simply darkening; violet, darker and more saturated violet. With color filters effects were observed similar to those obtained with spectral lights. It will be noted that the dimming colors recorded above involve exclusively the chromatic components B and R, the B being decidedly predominant. In this connection it should be recorded that dimming of the stimulus afforded by a sheet of Hering blue paper in bright sunlight (6,700 meter candles and the natural pupil) yields a brilliant saturated red.

"Although the results recorded above do not lend immediate support to Hering's conception of the appearance of antagonistic colors through dimming, there are, nevertheless, striking phenomena observed during the dimming experiment which bear out Hering's general conception of color antagonism. For example, the failure of the G component to appear with the dimming of a red stimulus until the latter is practically extinguished may obviously be attributed to the antagonism between this component and the R excitation natural to the stimulus. The B easily comes to view because of the weaker Y valency of the given light: similar considerations apply to

the green stimulus; with very strong dimming the latter yields a violet or purple. The predominance of the blue may be explained by the idea—in favor of which there is much to be said—that the mechanism underlying the B component is much less rapid in its adaptation changes, or else has a higher equilibrium level than that of the other components. This conception is in harmony with Hering's general views."

In this work Troland also studied the effect of dimming white lights. "The occurrence of the dimming contrast effect with ordinary white light was verified by experiment with a number of subjects. All the whites employed, with the possible exception of sunlight on white drawing paper, showed marked chromatic effects upon dimming, but these varied not only with the length of the preexposure and the original or primary intensity of the stimulus, but with the observer." Troland also pointed out that his experiments indicated that preëxposures of the stimulus for durations less than a second before dimming gave much richer and more prolonged effects than those of longer preëxposure periods. Ordinarily such short exposures of stimuli to the retina are quite favorable for positive after-images, when dimming is practically complete or total as in the case of projecting after-images on gray backgrounds. Hence it is to be expected that positive after-images would be involved in dimming effects of short preëxposures of the stimulus. Actually, "dimming the blue from the region of 451–455$\mu\mu$ of the spectrum after a preëxposure of one-eighth second and at 600 photons, the dimming effect was a positive, lasting 30 seconds, which was followed by a negative persisting 200 seconds. With spectral red under similar conditions, no effects of this sort were obtained." These latter observations were more or less of a casual nature but they are offered as suggestions to possibilities of research by the dimming effect procedure.

Having shown that the contraction of the pupil has much influence on the fluctuation of images, Troland (**18**, 368) pointed out that the dimming effect could be induced by the contraction of the pupil "as well as by turning down of the lamp or the closing of a shutter." He, then, applied this logical deduction to actual experiment and confirmed its truth in the case of fixating light spots of low intensity. The disappearance of the spot of light, upon the increasing adaptation of the eye, correlated with the moments of the contraction of the pupil.

In the paper on "The Influence of Changes of Illumination on

After-Images," Troland (19, 499f) devotes much of the space to the consideration of the dimming and brightening effects. The converse of the dimming is the brightening effect which is governed by laws similar to those conditioning the dimming effect. The qualitative difference is that the dimming contrast effect shows a tendency to be displaced towards the complementary hue or the negative after-image, whereas the brightening effect tends toward the positive. The effect in either case fades quite rapidly, being only in evidence during the change of stimulus conditions, and so Troland suggests that both kinds of effect depend on the lessened resistance to change of the stimulus by the fatigued parts of the retina.

By the method of changing the illumination, either brightening or darkening, Ebbecke (2) distinguishes between the visibility of the after-image and the presence of retinal after-stimulation. A theory in terms of the adaptation of the eye to its own after-images is proposed to account for the changes from positive to negative, and *vice versa,* that the after-images undergo as the results of change in the illumination.

A large mass of data concerning the dimming effect under abnormal conditions is available under the topic of Erythropsia. Much of the evidence is of a clinical kind. The phenomenon of Erythropsia or red vision seems to be experienced by patients after cataract operations. The sudden increased sensitivity of the retina to brightness in the case of these subjects causes them to see reddish purple when brightly illuminated rooms are exchanged for more subdued ones. Fuchs (6) showed that Erythropsia may be experienced by the normal eye under conditions of intense and prolonged glare of snow light. This paper is the most important experimental work on this subject, and has had considerable influence upon the theorizing of ophthalmologists.

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EXTROVERSION AND INTROVERSION

BY J. P. GUILFORD AND KENNETH WALTER BRALY
University of Nebraska

No single pair of traits of personality has been quite so widely discussed and studied as that of extroversion and introversion. Originating with the psychoanalysts, with Carl G. Jung in particular, extroversion and introversion have been slowly stripped of the poetic terminology which has been used to describe them, and brought within the reach of experimental methods. Sometimes the distinction between them is a matter of the direction of interest of the individual; at other times it is a matter of readiness or facility of adaptation, especially to the social environment; again, the distinction is made on the basis of the balance or proportion of overt and covert behavior exhibited by the individual. The distinction, then, seems to have intellectual, emotional, and social aspects.

Psychological theories or definitions: No clear-cut classification of the theories of extroversion-introversion can be made. While they fall roughly into the three groups mentioned above, there is so much overlapping that it would be folly to attempt to classify them in that way. There is a general belief that the extreme forms of both extroversion and introversion are pathological, although not always equally so.

Jung (24) first suggested a classification of individuals into the two psychological types on the basis of the "flow of the libido." In the extrovert the flow of the libido is outward toward the object. The object contains the unconditioned value for the subject and it determines to a large extent his reactions. In the introvert the flow of the libido is inward from the object. The unconditioned value is in the subject. In the final analysis extroversion and introversion are not traits of personality, but rather they are *mental mechanisms* which can be turned on or off at will.

Not being able to classify all cases into these two types, Jung proposed four sub-types for each one (26). These sub-types are distinguished upon the basis of the function which plays the dominant rôle in the adaptation of the individual: sensation, feeling, thinking, and intuition. The dominance of any function is proportional to the

degree with which it is differentiated from the unconscious. This does not complete the picture for Jung. The types are cut across by the factor of compensation (**26**). If the individual is introvert in his conscious adaptations, he is extrovert by way of compensation, in his unconscious adaptations. If one of the four functions is very highly differentiated for conscious mental life, the balance is restored by a strengthening of the other functions in the unconscious mental life. Thus everything can be explained and one can have one's cake and eat it, too. The only support for these views consists in the clinical examination of neurotics and the post-mortem examination of literary and historical material.

Jung should not be given the entire credit for the origin of the extrovert-introvert dichotomy. As early as 1900, Stern (**46**) had suggested a pair of types known as "objective" and "subjective," which he found to differ in regard to simple reaction time under sensory and motor instructions and also in their reactions in the *Aussage* tests. Others who wrote later concerning these same two types are Klages (**28**) and Kurella (**29**).

Another writer previous to Jung, and one to whom Jung gives some attention, is Otto Gross (**15**). His two types, which were discovered in the field of pathology, were called the "deep-narrow" and the "shallow-broad." They were distinguished upon the relative amounts of "primary" and "secondary" function present, the primary functions being those which follow directly upon stimulation, and the secondary ones being those which persist after stimulation and permit organization and systematization of sense-impressions. Heymans and Wiersma (**19**) contributed factual data which were derived from interviews with 2,523 individuals and which bear upon the characteristics of these two types.

It is indeed difficult to establish priority in this as well as in other ideas in science. We find William James distinguishing between "explosive" and "obstructed" wills in 1890 (**23**). He describes his "tender-minded" and "tough-minded" types in 1907 (**22**). J. M. Baldwin (**4**) speaks of "sensory" and "motor" types in 1902. It does not require much inspection to find a great deal in common in all these writers.

Beatrice Hinkle (**20**) wishes to split off from the usual extrovert-introvert dichotomy another pair of tendencies. She adds what she believes to be another dimension of personality with her objective and subjective types at either extreme. These types are distinguished on the basis of the degree of differentiation of the mental

processes in general from the unconscious. The subjective type has the greater differentiation, and is given to complexities and subtleties which are missed by the objective type. Extreme subjective types exhibit instabilities.

William A. White (52) accepts Jung's definitions of the types, but he also emphasizes the abnormality, if not the pathology, of introversion. Introversion, for White, is "a lessened capacity for integration of the personality, of separating the self from the not-self." Thus, extroversion is allied to the process of individuation, while introversion is allied to the opposite tendency, or regression.

While there is little proof one way or another, many of these writers regard the traits as hereditary in nature. Jung, Hinkle, and Wickes, all insist upon the innate determination of them, and even venture the warning that a radical change of the tendency of an individual may have dire consequences. On the other hand, some writers admit that the fundamental basis of the traits may be hereditary, but believe that moderate changes can be made without harm. Among the latter group are Nicoll, Tansley, Freyd, McDougall, and Conklin.

Wells (51) conceives of introversion as an adjustment which avoids the unpleasant or the necessity of external effort. Satisfaction is rather sought within the self, in imagery and day-dreaming.

Allport and Allport (1) include extroversion-introversion among the traits of "self-expression." The distinction is made on the basis of the attitude of those whose images and thoughts are readily expressed in overt behavior and those who create an inward, imaginary world as a substitute for the real world. G. W. Allport (2) says that extroversion and introversion, like other traits, may be defined as independent, statistical variables; as a hierarchy of integrated specific habits or a dynamic trend of behavior resulting from such a hierarchy, and as a habitual mode of adjustment governing specific responses. He makes no choice among these interpretations.

June Downey (11) finds extroversion and introversion to be constellations of traits which are included in her analysis of will-temperament. Introversion includes slowness of movement and decision, inertia and tension, inflexibility, interest in detail, and volitional perseveration. Extroversion includes the converse of these tendencies.

Conklin (7) attempts to interpret introversion and extroversion in the language of academic psychology when he takes the conditions of attention as a basis for them. Introversion is the state of mind

in which attention is governed by subjective conditions and extroversion is the state in which attention is governed by objective conditions. He introduced the term "ambivert" to designate those individuals who retain a flexibility which permits fluctuation from the one state to the other. Something like a normal distribution is assumed and so the division of people into two separate and distinct types would disappear as a possibility.

Later, Conklin (10) considers introversion and extroversion as distortions of thought. Both are regarded as flights from reality or attempts to evade the issues of life, the former being a withdrawal within, an egocentricity, while the latter is a "flight into reality." The terms "para-introversion" and "para-extroversion" are suggested for these pathological forms.

Freyd (13) attempts to assimilate and to epitomize all definitions as follows: "Introvert: An individual in whom exists an exaggeration of the thought processes in relation to directly observable social behavior, with an accompanying tendency to withdraw from social contacts. Extrovert: An individual in whom exists a diminution of the thought processes in relation to directly observable social behavior, with an accompanying tendency to make social contacts." He has also collected a list of fifty-four descriptive behavior-traits from various authors, a list which has formed the basis for several rating scales since that time.

Physiological theories: While some of the above writers have hinted at a neurological or glandular basis for these traits, none of them have anything like a working hypothesis which is based upon bodily processes.

Kempf (27) was the first to suggest a neurological foundation for these tendencies. The underlying basis, according to him, consists in the relative development and dominance of the autonomic and central nervous systems. The introvert has a more highly developed and more dominant central nervous system, and hence he is more subject to inhibitions and delayed responses of a directly adaptive nature.

Marston, who was primarily interested in the study of emotions, regards introversion and extroversion as a matter of inhibited emotional expression, although he admits differences outside the sphere of emotion (36). "Extroversion is the skeletal expression of emotion; introversion is the dissipation of emotionally aroused energy within the organism rather than the adequate discharge of this energy through skeletal channels upon the environment." This theory is

essentially the same as that of Kempf; the two traits are correlated with the two systems, the central and the autonomic.

Ramsey Hunt (21), who considers the two fundamental processes of neural functioning to be excitation and inhibition, believes that the solution of types is to be found best in terms of these two processes. These coöperative, but opposing processes, by their balance, regulate all activities of the organism. He believes, moreover, that inhibition must be considered just as active a process as excitation, rather than merely as a negation of excitation. He proposes the name of "erethitic" for those individuals in whom inhibition tends to be the stronger process, and "kolytic" for those in whom excitation tends to be the stronger, but he recognizes that these two types are analogous to the introvert and the extrovert, respectively.

An outstanding theory of the types under consideration is that of McDougall (34). He interprets introversion and extroversion either as opposed tendencies of temperament, or as maximum and minimum points on a scale of a single positive factor which he believes is due to some general property of the nervous system. The probability is that this general property is of a chemical nature or a resultant of metabolic differences. The factual basis for the last statement is the marked effect of certain drugs upon these temperamental traits. An individual's position on the scale may be shifted toward the extrovert end by alcohol, ether, chloroform, and allied drugs, and toward the introvert end by strychnine, morphine, caffeine, and other alkaloids.

Another point of evidence is the fact that hypnosis can be induced easily in hysterics and cyclomanics, who may be considered extreme extroverts, while schizophrenics, who are extreme introverts, are hypnotized only with great difficulty, if at all. The drugs mentioned, moreover, seem to increase or decrease, respectively, the ease with which hypnosis may be induced, as if the expected shift toward the extrovert or introvert end of the scale, respectively, had been made.

These facts lead McDougall to suggest that extroversion is a matter of the tendency toward dissociation, and the physiological theory of dissociation in general is a heightening of synaptic resistances. Extroversion depends upon a heightened resistance of the synapses, and introversion upon a lowered resistance. The mark of the introvert is therefore greater activity of the higher brain centers and an inhibition over the lower centers. The essential mark of the extrovert is the ready transmission through the lower centers; action without inhibition.

Rating scales and tests: A number of rating scales and tests have

been devised and used in various ways. The tests must be regarded as very tentative, as yet, since none of them have had a very rigid trial, and the results which have been obtained from them must also receive suspended judgment. Nearly all of them depend upon subjective judgments, either of the rater himself or of others who have observed him.

One of the first scales, and the one which is probably most widely known, is that of Laird (**31**). His list of forty-one tendencies may be rated in ten steps or degrees ranging from extreme extroversion to extreme introversion, by the subject himself or by an associate. After giving the test to several thousand individuals, both in industry and in college, Laird concluded (**32**): that women tend to be more introverted than men; that youth tends to be more extroverted than old age; that there is little or no relation between introversion-extroversion and intelligence; that there are no constant racial differences in these traits; that foremen and executives tend to be distinctly extrovert and that office workers and research workers tend to be introvert.

At about the same time Marston attempted to develop both a rating scale and a more objective test based upon observed behavior (**36**). One hundred nursery school children were rated by three of their teachers on twenty pairs of opposed tendencies, most of them social in character. The behavioristic tests were designed to measure the five following factors: social resistance, compliance, caution, interest, and self-assertion. The test-situations were simple and natural, and the rating of the child's response depended upon arbitrary standards. Results from both tests and rating scales indicate that boys are more extrovert than girls and that there is an increase of introversion with advancing age. The correlations between the two kinds of measurement were of the order of .50.

Heidbreder (**17**), using the items of the Freyd list of some fifty behavior-tendencies, secured self- and associate-ratings of 200 students. A normal distribution curve was obtained for the group. The relative diagnostic value of each item of Freyd's list was determined. She repeated (**18**) the procedure with 200 new subjects and found all but six of the items highly diagnostic. She found no significant sex differences with this test.

Guthrie (**16**) compared six different tests with each other, four of which had been devised as tests of extroversion-introversion, using 265 students as subjects. The tests were as follows: an intelligence test; scholarship records; the Laird personal inventory, which he

found to have a reliability coefficient of .60; a campus-information or gossip test, with a reliability of .72; Jung's word-association test; and an instructor-rating test, in which the students judged their instructors. All inter-correlations were so small as to be regarded as negligible, which would indicate that the tests had little or nothing in common.

Travis found that the auditory threshold is raised during reverie in negativistic subjects and is lowered under the same condition for suggestible subjects, both normal and pathological (**48**). It would seem, because of the connection between extroversion and suggestibility, that this simple objective test would also be diagnostic of extroversion-introversion. Travis later tested fifty-nine pathological subjects (**49**) and found that every one of twenty-two patients classified as "psychoneurotic," for which he gives no specific definition, had a lowered threshold during crystal-gazing, and twenty-one of twenty-four dementia praecox patients had a raised threshold. Of the three latter cases who had a lowered threshold, two could be hypnotized, and the other one had been doubtfully diagnosed as dementia praecox. Two facts disqualify the threshold test as an acceptable criterion of extroversion-introversion. In the first place, we do not know that the psychoneurotic group was composed entirely of extrovert cases. In the second place, both of the two manic-depressive patients who were tested had a raised threshold and this group is usually regarded as extrovert.

Conklin (**8**) introduced a test which requires the subject to estimate the degree of agreeableness or disagreeableness of forty proposed activities. Its aim is to measure differences within the normal range of introversion-extroversion. The reliability of the test, determined by correlating halves of the test given to over 300 subjects, was .92. The correlation with the Laird test was .37, in spite of the fact that the Conklin test is restricted to the direction of interest or attention alone. Men proved to be more extrovert than women, as might be expected from the types of activities used in the test. Differences were found between different professional groups in the university and outside the university.

Campbell (**6**) applied the Freyd list to insane patients. Self- and associate-ratings correlated .37. She found that the test discriminates very well between the different forms of psychoses, but the numbers of cases are entirely too small to be significant.

McDougall (**34**) suggested a very simple and objective test for these opposed tendencies. Upon the two assumptions, (1) that

these two traits are distinguished by the degree of dissociation of the higher nervous centers, and (2) that the rapidity of the fluctuations of an ambiguous figure stands in an inverse relation to that degree of dissociation, he uses the frequency of alternation of a simple ambiguous figure, *e.g.*, a rotating windmill wheel, as an indicator. The experimental fact, based only upon three subjects (35), that the alcoholic group of drugs reduces the rate of fluctuation and that the alkaloid group increases the rate, in a measure justifies the use of such an indicator.

In some studies at Vassar (50), however, little or no agreement was found between McDougall's indicator of extroversion-introversion and Marston's rating scale for the same thing.

Bender (5) found a correlation of .379 between the Freyd list and Allport's ascendance-submission test when applied to approximately 400 students. Thus the grouping of these two pairs together, as Allport does in his analysis of personality (1), receives some experimental support. The fact that the two tests contain some nearly identical elements, however, should guarantee a certain degree of positive correlation.

Neymann and Kohlstedt (41) have recently devised a test which bears resemblance to both the Marston and the Freyd tests, especially to the latter. The fifty items of the test were selected from twice this number used with cases of insanity. One hundred patients displaying symptoms of schizophrenia and also 100 cyclomanic patients were used as subjects. A distinctly bi-modal curve resulted. The reliability of the test has not been established. The validity of it rests upon the fact that correct diagnosis of the two psychotic groups could be made in more than 93 per cent of the cases.

Physical correlates of introversion-extroversion: A number of studies have indicated that there is a physiological basis for these traits, or for traits of a related character.

One outstanding attempt to correlate psychological types with morphological types was made by Kretschmer (29). He calls the two psychological types "cycloid" and "schizoid," as they resemble the cyclomanic or the schizophrenic types of psychotics respectively. The two chief physical types are the "pyknic" or the compact, full-bodied type, and the "asthenic" or the narrow, thin-chested, slender type. He found a close correlation between the cycloid and the pyknic types, and, although the schizoids were of more varied physical types, they were most commonly of the asthenic group.

Mohr and Gundlach (37) studied eighty-nine native, white, male

inmates of the Joliet prison. They were classified into Kretschmer's three groups as follows: 19 asthenics, 26 athletics, and 44 pyknics. Nineteen psychological tests were applied. Wide differences were found between the asthenic and pyknic groups in at least nine of the tests. The asthenic group was found to be superior in the intelligence test, the information test, and in several tests of speed of reaction. The two groups were about equal in tests of attention and learning ability. The striking novelty of these results lies in the fact that speed of reaction has usually been attributed to the extrovert rather than to the introvert pattern.

Naccarati and Garrett (40) divide people into three physical types: the macrosplanchnics, in whom the trunk predominates over the development of the extremities; the microsplanchnics, in whom the limbs are more developed than the trunk; and the normosplanchnics, or the middle class. Kretschmer's work had been verified previously as far as the abnormals are concerned (39). With fifty-four normal students as subjects, a rather significant correlation was found between the body index and the Laird personal data test.

Bender (5) secured data which can be interpreted as verifying these relationships, the introvert being more microsplanchnic and the extrovert being more macrosplenchnic.

Furukawa (14) attempted to correlate temperament with blood group types. Two hundred sixty-nine school girls were used as subjects. The temperamental types were designated as "active" and "passive," but they may be readily identified with our extrovert and introvert, respectively. Using the isoagglutinin test, Furukawa found that the active group tended to fall in types I and III of the blood groupings, and the passive group in types II and IV. The correspondence was 81.7 per cent in the first case, and 79.5 per cent in the latter.

Rich (43) attempted to determine the relation of bio-chemical differences to personality. Chemical tests were made with fifty-seven students by measuring the acidity of urine, the presence of inorganic phosphorus, and of creatinine, and the hydrogen-ion concentration of the saliva. Ratings were obtained in good-naturedness, emotional excitability, perseverance, leadership, and aggressiveness. The results were confirmed in a study of 303 children. Rich's conclusions are: The least excitable individuals tend to have the most acid fluids, while the more excitable persons tend toward neutrality or alkalinity in their fluids. The least aggressive excrete the greatest amount of acid and have the highest alkali reserve in the blood. Emotional excitability tends to bear an inverse relationship to the creatinine in the

blood and urine. These conclusions are based on correlations between .20 and .30, which he thinks would probably be raised under more carefully controlled conditions, although these low coefficients may indicate the low share that body chemistry contributes to personality. Specific ratings of introversion-extroversion were not obtained, but the differences which were studied by Rich resemble, in a measure, the differences in those more inclusive traits.

McDougall and Smith (35) secured evidence of a chemical basis for extroversion-introversion. They found extreme differences in the rate of fluctuation of an ambiguous figure which corresponded to subjective estimations of extroversion-introversion. Only three subjects were tested, however. Drugs had a marked effect upon the rate of fluctuation, and the two groups, the alcoholic and the alkaloid, influenced the rate in opposite directions.

Conclusion: There is considerable agreement among psychologists upon the existence of a bi-partite distinction known as introversion-extroversion and there is some agreement upon its definition, although the intellectual, emotional, and social aspects of it are variously emphasized. Tests and rating-scales for the trait have in general an unsatisfactory reliability, and when applied to the same group no two of them agree to any appreciable degree. We need very much to know whether there are such constellations of habits, tendencies, or dispositions which can be called extroversion and introversion. A measurement of the frequency of coincidence of the various partials which have been suggested for these two constellations, those items of the Freyd list, for example. will help to determine whether we are talking about such entities as extroversion and introversion and to decide just what they do include. The technique of Spearman (45) for testing for general, group, and specific factors may be applicable in this case, and may solve the riddle of personality traits in general. Having established the reality of such traits as extroversion and introversion, we are ready to look for simple objective tests and for some physiological basis for them.

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HUMOR AND THE LUDICROUS

BY CHARLES M. DISERENS AND MABEL BONIFIELD
University of Cincinnati

Since the article of Diserens (9) on laughter, in 1926, work on the subject has proceeded at about the usual rate. The classifications of laughter theories suggested at that time remain valid, no new type of theory having been developed. There is, however, an increasing tendency to stress social factors in the genesis and functioning of laughter. It will be noted that very few important contributions have been made.

Williamson (31) and Kimball Young (33) give historical accounts of the study of laughter and the ludicrous. Kimmins (22), in the first four chapters of his book, deals with the methods of studying laughter and historical theories of laughter from Hobbes to Freud and Bergson. Kimmins evaluates the theories and praises particularly the treatment of Hobbes, Spencer, and Bergson, for clarity and originality.

Dupreel (11) gives an historical review of theories of laughter. He distinguishes three types of theory: (1) Nonsociological theories of two classes: (a) the philosophical, treating of the nature of the object, and (b) the psychological, which is concerned with the character of the reaction. Hobbes, Descartes, Darwin, etc., are interested in this type. (2) Semi-sociological theories of laughter, of which the theories of Sully, Bergson, and Dumas are examples. (3) Sociological theories. Depreel himself is chiefly interested in the sociological point of view, for the other points of view do not throw any light on the nature of laughter itself. Bergson and Sully tend in this direction, but their analyses are incomplete. The author insists on a complete sociological theory. He says: "Le probleme sociologique du rire, c'est tout le problem du rire." According to Dupreel, laughter has developed in a social setting and occurs in the relations of greeting and exclusion bound up with the life of the group. These two forms explain the ambivalent nature of complete laughter, viz., joy and malignity. Social life prepares in every one of us a kind of mechanism which may be set off by a myriad of possible incidents. Dupreel applies his theory to the consideration

of three problems: (1) The inequality of the sexes with respect to the comic, (2) the laughter of tickling, and (3) the nature of humor.

Hellyar (19) also stresses the ambivalent nature of laughter. The strongly paradoxical action, he says, depends on the "principle of double laughter." According to this principle, there are two laughters always necessary to laughter: comic and jolly laughter. Jolly laughter is the direct expression of jolly feeling; it is a spontaneous expression of delight, a direct response to a pleasurable feeling. It has no intellectual implications. Its only basis is the "interior feeling" of jollity which may result from a great variety of external causes. Jolly laughter covers all pleasure laughter; it occurs in situations that only the individual himself can know. Comic laughter is "laughter at" somebody or something. There is always some pleasure element in comic laughter. Both jolly and comic laughter are nearly always present in a specific situation. Laughter depends a great deal upon mood. When one is in a dull mood, comic incidents may go unnoticed. The spectator's state of mind must be one of mild and generalized pleasure. There must be a feeling of normal content. Self must not be involved in a laughter situation of this sort. The less one is disturbed, the greater the possibility of amused laughter. Jollity, therefore, is the best aid to the appearance of the laughter of amusement, for it provides the essential elements of that mental condition necessary to full comic laughter. A merry mood actually widens the comic horizon. Jollity seems to sharpen the comic appetite. Depression, on the other hand, saps the foundations of the comic mood and blunts comic perception. Taking this into consideration there should be a larger proportion of men of humor among the optimists and good natured men. Most theories explain the comic, Hellyar notes, but does not explain the situation of a man laughing at something he finds comical. The two are complementary. Bergson, Hellyar says, omits the feelings of man completely. Comic laughter is largely a question of the nature of the individual. Laughter of amusement involves other factors besides, but its basis is also temperament. Both the emotional and perceptual elements of mind combine to make laughter an absolutely individual affair. A merry mind and a quick grasp of comedy are the chief arbiters in making or breaking laughter. Although jolly and comic laughter are very different, the man who laughs in the one key usually laughs equally well in the other. A merry mind is not necessarily in tune with the comic in nature but is a mind primed to respond, and response is easier when it does occur. If jollity can-

not get true comedy, it makes it. A sense of humor depends essentially on the presence of certain intellectual factors, such as the power of perceiving shades of meaning that pass unnoticed by a clumsy mind. A profound perception of the comic demands a thorough acquaintance with the world of things and events and an unusual and keen insight into the subtleties of life. The reason that our wisest men are not the greatest laughers, as one might suppose if the above were true, is that our men of wisdom are very often self-appointed and the wise-acres can hardly be expected to laugh and, partly, because the intellectual effort of hard thinking is not, in itself, an encouragement to laughter. But the real reason is the man himself, *i.e.*, his temperament. The wise man, when a laugher, is a splendid one.

Laughter, Hayworth (**18**) says, is a social, not a biological function. His theory is one of laughter as a means of communication and not a complete theory of the ludicrous. Before primitive man could talk laughter was a vocal signal to other members of the group that they might relax with safety. Facial expression as well as vocalization was, as it is today, a definite means of communication, and the smile was a visible symbol of the same meaning as, and derived from, the vocal signal. An aggressive, conquering attitude leads to laughter; an attitude of inferiority does not. The former fact is due to the presence of, and the latter to the absence of, a feeling of safety. We laugh more and heartier in a group than when alone because there are more individuals to whom we must convey our feeling of safety. When we hear someone else laugh, we are apt to laugh, for we are picking up the signal. This was very desirable in primitive times. We enjoy being laughed *with*, for that conveys a mutual realization of safety, but we resent being laughed *at*, for that implies the superiority of the one who is laughing. To sum up this theory, anything which disturbs the feeling of social safety or of individual safety has its corresponding effect on laughter. No one normally laughs unless he and his group are safe.

Joy, according to Hayworth (**18**), is the concomitant of laughter. Although laughter did not originally cause joy, according to his theory, Hayworth believes that the more we give ourselves to laughter the more fully other conditioned physiological changes will produce joy.

The writer of an editorial in the *Nation* (**1**), however, claims that the display of a sense of humor by laughing is not the act of a truly joyous man. He says that a sense of joy or a passionate interest in

some highly abstract and inexpressible thing is characteristic of the happy man, even though this sense of joy is almost always accompanied by solemnity. As an example of such a happy man, he gives the poet Wordsworth, whose works are by no means humorous, but which nevertheless emanate joy. The so-called humorous person, on the contrary, deems a sense of proportion, rather than an abstract passion, the most important thing in life.

J. J. Walsh (**28**) discusses the physiological side of laughter. The principal physical agent in laughter is the diaphragm. In ordinary respiration it moves up and down from two to three inches; in laughter from four to six inches. The result is that it has considerable effect on the important organs which have anatomical relations with it. These organs include the lungs, the heart, the liver, the pancreas, the spleen, the stomach, and the intestines.

Laughter also affects the ductless glands. Walsh says: "Laughter may be looked upon as an invention of nature to compensate for the diminution of organic friction and massage consequent upon man's erect position." Laughter relaxes mind and body and keeps us from considering ourselves too seriously. Walsh thinks that laughter is probably the most important of the diaphragmatic activities, all of which have a definite purpose for the safeguarding of health and the prevention of disease development.

In another article (**4**), Walsh stresses the connection between blood pressure and laughter. Man is the only animal who both laughs and suffers from blood pressure. Laughter, he claims, is a remedy for both high and low blood pressure. This seems significant both from a genetic point of view and also from a practical, for if the relation between blood pressure and laughter proves to be a really definite one in a large number of cases, undoubtedly it will be made use of in therapeutics.

Armstrong (**6**) also thinks laughter is physically as well as mentally beneficial.

A contribution intended to stimulate experimental studies is that of Carpenter (**8**). In 1922 he gave the superiority theory of Plato and Hobbes a new angle by calling laughter a glory in sanity. We laugh at recognizing our sanity, *i.e.*, our accuracy of judgment. For things to have a comic aspect they must be perceived (a) as false or deceptive, (b) abruptly or suddenly. Recently Carpenter (**8**) has offered the following corollaries: (1) Everything comic states or suggests something perceived as a falsehood. (2) Nothing conveying a falsehood is thereby comic so long as it deceives. (3) Nothing

conveying a falsehood is thereby comic unless it tends to deceive, or, in other words, unless an effort of judgment is needed to perceive the falsity. (4) Anything conveying a great enough falsehood that is suddenly perceived as such by an effort of judgment is comic (for a free and susceptible mind). (5) Of two things conveying falsehoods of equal degree the one requiring the greater effort of judgment to perceive the falsity is the more comic. This theory makes incongruity the basis of the comic. This dates back to Schopenhauer. But neither Schopenhauer or anyone else has explained why incongruity excites a pleasant emotion. It is the "effort of judgment" which is the crux of whatever is new in this theory. Carpenter says if it can be proved that the effort of judgment always occurs when the sense of the comic is aroused and that the sudden rejection of a sufficient falsehood by an effort of judgment will always arouse a sense of the comic in an open mind, then the agreeable quality of the emotion is associated in some way with the power of judgment. If it could be proved that the intensity of the emotion varies directly with the effort and also with the degree of discrepancy overcome by the effort, the final inference that the emotion is pleasure in the power of judgment would seem inescapable. This theory may be tested by determining whether an effort of judgment is thus related to the sense of the comic in the rejection of falsehoods. By "effort of judgment" Carpenter means a relatively strong exertion of the faculty that works abundantly and unceasingly in every conscious moment to interpret and correlate experiences. He does not mean obvious effort, necessarily. We can study this "effort of judgment" by studying at leisure the material on which it works. Carpenter has not studied this himself. He merely puts forth the idea for others to work on.

Myerson (26) notes that "It is one of the curious by-products of the comic spirit that it finds one of its most prolific themes in insanity. Everywhere on the stage and in the little comic by-plays of everyday speech and act which enliven the folk-life, the supposed conduct and speech of the insane man is a source of never failing merriment. This is in striking contrast with the attitude toward the so-called physical diseases. No comedian of the stage or of private life can raise a laugh with the comic portrayal of cancer or of heart disease, though the grotesque portrayal of the tragedy of mental diseases has given more than one clown a reputation. It is probable that this curious reaction toward the mentally sick arises in part, at least, from the fact that our sense of superiority is heightened in their presence,

while sympathy for them is, in the majority of people, neither fundamentally nor intensely aroused.

Kimmins (22) takes up the question of the development of laughter in children. "Laughter comes naturally when the neuromuscular mechanism is sufficiently developed for its production." Prior to this the baby smiles and makes sounds which later develop into laughter. In learning to walk the child appears to find delight in muscular mishaps. Incongruous sights and sounds of babyhood play a part in the genesis of laughter.

Washburn (29) made a study of fifteen infants. She found that smiling and laughing behavior vary considerably as growth proceeds, with more striking and consistent developmental differences in smiling than in laughing behavior patterns. Four personality types emerged from the differences in laughter behavior.

Enders (12), experimenting on children two, three, and four years old, found that sound and motion or a combination of both are the most effective elements in stimulating laughter in children of all these ages. Motion is the most effective with two-year-olds. The older children were interested in word play. All children laughed most frequently when with other children.

Kimmins (22) made a study of children between the ages of five and twelve. There was a marked increase in verbal humor. "Verbal humor seems to run along the lines of a logical sense of incongruity and of reasoning ability." Their visual humor seemed to depend upon their emotional development. "At the period of rapid growth from eleven and a half to the end of the thirteenth year, there is a decline in the sense of verbal humor." Visual humor is less affected. Unlike Enders, Kimmins found that there was correlation between a sense of humor and intelligence.

"In the earlier years there may be traced a fairly regular continuous growth of the appreciation of humorous situations which cause smiles or laughter, but in the period of rapid growth, from twelve to fourteen years, progressive development is difficult to trace; from fourteen to eighteen years, the springs of laughter . . . are comparatively easy to discover" (22).

Kambouropoulou (21) conducted an experiment on college girls to discover individual differences in humor. She found that there is a fair degree of consistency to types of humor. These types are primarily the personal and impersonal. Mental ability apparently bears no relation to these types. She concludes that experiments relating these types to temperament and character and determining

the relative influence of these and mental ability must be performed before the sense of humor can be further analyzed.

Wynn-Jones (**32**) tells of the following experiment: Two series, each of eighteen paragraphs, of various forms of wit were shown to children of both elementary and secondary schools, and to university graduates. The results of this experiment seem to show that locality plays a significant part in appreciation as compared with some general factor. If the point of a story is not manifest there is an active search for a clue.

A modification of McDougall's theory that laughter constitutes a protection to the organism against excessive suffering in sympathy with the maladjustment observed to inhere in the ludicrous situation has been suggested (**16**). Laughter situations to which it is difficult or impossible to apply the antidote hypothesis are cited. The most general formula for the modification seems to be (the author is not wholly clear on this point) that laughter represents a discharge of energy left unexpressed by the checking or failure of an object, of any mild conative tendency, provided the impulse to laugh be itself present in sufficient strength. Instances are cited and classified under the major impulses. Laughter is assigned a place in the scheme of impulses in the defense mechanism group, along with flight, the appeal or submission, and reduction or abolition of consciousness. The order in which these, together with the offense group, anger, etc., are invoked is presented, with experimental evidence drawn from observations of an infant in typical fear situations.

We may now proceed to the categories of the ludicrous. It will be remembered that Freud contends that the ludicrous always represents some economy in the expenditure of mental energy. Wit, humor, and the comic comprise the three categories of the ludicrous. The pleasure of wit is due to the economy in the expenditure in inhibition, of the comic to the economy in the expenditure of thought, and of humor to the economy in the expenditure of feeling (**9**). In his recent discussions of humor, Freud adds that it is a triumph of narcissism and the pleasure principle. Humor is the assertion of the ego of its invulnerability. It involves the super-ego taking a parental attitude toward the ego as a child. When the ego is afraid of dangerous reality, the super-ego, when sufficiently inflated by its hypercathexis, can comfort it with humor, thus making the wounds inflicted by the outside world an occasion for pleasure (**14**). In cases where the humor is directed against the self, the ideal-ego becomes the parent which treats the ego as a child (**15**).

Humor is idealism tempered by sympathetic amusement, according to Robbins (3). Its basis is the perception of the discrepancy between what ought to be and what is, coupled with the belief that the difference, if realized, may be overcome.

Wilson (30) says that humor is a point of view. It comes from the sublimation of our unwanted impulses.

Real humor, according to Masson (25), must be true and must be put in such a form as to be startling.

Erskine (13) considers humor "the art of adapting one's self to another temperament." It is at its best, he maintains, when it is divorced from wit.

Attempts to arrive at a satisfactory definition of humor by means of a magazine contest reveal no new principle, to judge by the efforts quoted in the *Forum* (2). The following is typical of the definitions quoted: "Humor is the ability to obtain smiles, chuckles, chortles, grins, silent mirth, giggles, or laughs from our seeming calamities—the government of nations, relatives, taxes, religious doctrines, and modern male clothing."

Dunlap (10) gives the following classes of the comic:

1. The most primitive, includes bodily suffering and pain.
2. Suffering of a less serious nature, minor physical injuries, mental suffering.
3. Misfortunes and defects, physical and mental.
4. Suffering or misfortune accompanied by humiliation, sadness, degradation, on the part of the subject.
5. Moral defects, such as the beginning of vice in the young.
6. Horse-play or practical joking, premeditated or deliberate manufacture of laughable situations, manufacture of apparent accidents.
7. Degradation of imaginary characters in unreal situations, permitting of laughter on the part of those who are sympathetic in real situations.
8. The comic of embarrassment.
9. The mention or introduction of offensive matter, *e.g.*, the profane or the salacious.

The factors contributing to all of these types of the comic may be summed up under the general term "Inferiority." The degree of inferiority tolerated varies with the individual and the state of culture of his society, for the standard of reference by which inferiority is judged is usually one's self.

According to Hellyar (20), a man's notion of the comic is in-

tensely personal and spontaneous, being apt to occur when the mind is unoccupied. It is not necessarily pleasureable.

Wit is not specifically discussed in the articles under consideration.

The fact that age, sex, nationality, race, and breeding have an effect on one's sense of the ludicrous has been remarked by numerous authors. Kimmins (22) comments on the great tendency of children to join in the laughter of a group before the cause of merriment has been grasped. Between the ages of fourteen and sixteen years sex differences begin to appear. Extravagance of language in funny stories is less marked in girls than in boys. Boys tend to have a greater range and variety as regards humorous situations. There is much variation in sense of humor. At first, girls rank ahead.

In the case of negro children, the development of a sense of humor is generally retarded. In contrast to white children, at first, boys rank ahead.

Austin (7) takes up the question of sex differences. She puts forth a theory, clearly influenced by Freudian doctrines, to explain why it is that men are more apt to laugh at obscene jokes than are women. Man laughs because of the fact that nature has tied apron strings to him through the medium of his joy in procreation, and, after she has him securely bound, has let him in on the joke. Man laughs at what he fears as a defense mechanism. Woman, on the other hand, does not tend to laugh for three reasons: (1) because she undergoes the pain of creation and consequently looks at it in a serious light; (2) because she feels it is her duty to protect the youth so that their ideas of matrimony will be pure; (3) because it is part of her code, even though she realizes that the joke is on man, not to laugh at the failures of her lord and master. Mrs. Austin predicts that future generations of women will be able to appreciate the sex joke when they have been released from the drudgery of involuntary childbirth and can look upon such humor disinterestedly.

Walsh (28) thinks that the environment is responsible for the difference between the sexes. He predicts that the freedom now given to women will result in the diminishing, if not the end of, these differences.

Kimmins (22) says that the fundamental sense of humor differs little in England and America, but that the influence of professional humorists has an abnormal effect on the favorite subjects for laughter in America.

Kinosuke (23), by quoting two stories regarded as humorous by

the Japanese, endeavors to prove that Japanese and American humor are closely allied.

Kimmins (22) and Thomson (27) comment on the relation between laughter and tears. Kimmins says: "At times of great strain, laughter and tears come to each other's relief." Thomson points out that the stimuli for humor and laughter do not differ at the outset from those of sorrow and weeping. There is a tense moment of suspense which is followed by pain or pleasure, sorrow or joy. Painful results evoke sorrow; trivial results, joy and laughter, the latter accounting for the accompanying sense of superiority which is further heightened by surprise when that element is present. Wilson (30) notes that all humorous situations are disagreeable if taken seriously.

Laughter is a form of energy. Armstrong (6) says that it is a humanizing and socializing force. It settles more arguments than does logic. It restrains pioneers and radicals and detects imposters. It preserves the sane and normal. Mace (24) agrees with Armstrong that great possibilities lie in the power of laughter. Both predict that some day its energy will be controlled for social purposes, *i.e.*, the comic excesses of whole continents which culminate in world war will be checked. Laughter as a weapon will favor established institutions, according to Mace, since the fat and the prosperous can laugh best. Armstrong concludes by saying that laughter is one of mankind's most valuable functions which should be consciously cultivated and applied in promoting human efficiency and happiness.

Graves (17) says much the same of humor. He predicts that humor will be much better organized in the future, and he suggests many new possibilities for laughter which man's increasing mastery of science will bring in its train. Thomson (27) says that humor is a manifold means of social control which may make or mar the fortunes of the individual according to whether he is a participant or a victim. Wilson (30) declares that humor can do more than a League of Nations to keep peace in the world.

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PRECAUTIONS IN ANIMAL EXPERIMENTATION

The need for safeguarding experimental work upon animals is indicated by laws which from time to time are proposed in different parts of the country. An excerpt from a bill proposed last spring in the state of Illinois is given below:

"Any person who experiments on the body of a living animal for the purpose of ascertaining or demonstrating any fact in physiology or pathology, or for any other purpose, or any medical college, school or research laboratory, or the directors, trustees, managers, proprietors or employees thereof, who permits such experiments to be conducted in or upon the premises of such institution, or who keeps in captivity, any animal for the purpose of such experiments, or who refuses to permit any duly constituted officer or authority to make a full inspection of the premises of such institutions at any reasonable time, the time during which classes are held being deemed to be a reasonable time, shall be liable to a fine of five hundred dollars ($500), or imprisonment in the county jail for not more than one year, or both." (Senate bill 221, Div. I, Sec. 50a.)

The above bill had a hearing on April 19, 1929, in the City Council Chamber, Chicago, at which its friends and foes expressed openly their views. Owing largely to the excellent work of the American Medical Association the bill was put to sleep during the hearing and never came to the floor of the legislature.

The incident shows the need for constant vigilance to protect animal experimentation from the propaganda of anti-vivisectionists and from the unenlightened actions of humane officers. The experience of England with anti-vivisection laws should be constantly before us.

What can the individual psychologist do to assist in the protection of animal experimentation?

(1) Experimental investigations with animals should be conducted according to the code of rules regarding animal experimentation[1] which was adopted in 1925 by the American Psychological

[1] The code is published in the PSYCHOL. BULL., 1928, 25, 487–8. It has been recommended that this code be conspicuously posted in every laboratory where experiments with animals are conducted. In one laboratory all operators are required to sign the code.

Association. This code is now in force in all medical schools and research institutions in the U. S. A.

(2) Manuscripts, whether articles or abstracts, should contain no statements descriptive of cruel or inhumane treatment of laboratory animals. Editors are urged to reject manuscripts describing experiments which violate the code. In some cases positive statements should be made showing the steps taken to avoid needless suffering of animal subjects.

(3) In the classroom the psychologist can occasionally discuss the nature, requirements, and values of animal experimentation and the dangers from unenlightened legislation. This would help along the slow process of public education and possibly help to remove prejudices.

The American Psychological Association maintains a standing committee to look after the interests of psychologists in protecting animal experimentation. This committee aims to coöperate with agencies organized for the same purpose, to inform psychologists regarding the need and means of protecting animal experimentation, to distribute from time to time the code of rules regarding laboratory animals, and to act in the name of the American Psychological Association when a legislative emergency arises.

Suggestions, criticisms, and comments will be gladly received by members of the committee, which at present is composed of Professors Edward C. Tolman, Robert M. Yerkes, and the writer.

PAUL THOMAS YOUNG, Chairman,
Committee on Precautions in Animal Experimentation.

University of Illinois, December, 1929.

SPECIAL REVIEWS

EDWARD BRADFORD TITCHENER. *Systematic Psychology: Prolegomena.* Edited by H. P. Weld. New York: Macmillan, 1929. Pp. xi+278.

More than a century ago, when scientific activity was centered in France and scientific knowledge was beginning to get out of hand, the big French handbooks in the different sciences began to appear. For a while Germany translated them and then it took the initiative away from France. Germany was, and still is, the land of the all-inclusive, systematic, scientific treatise. Wundt, in promoting the new experimental psychology in Germany, fixed the habit of the encyclopedic handbook upon psychology. However, as the sciences became still more unwieldy, the possibility of a complete handbook by a single author was outgrown, as Wundt himself had discovered by the end of the century.

Titchener, as we all know, was the leader of the Wundtian tradition in America, in fact, the frame of reference in respect of which other American psychology could exhibit its heterodoxy. His greatest books are the four volumes of his *Experimental Psychology* (1901–05); they represent his effort to establish the scientific status of psychology. When he had finished them, he settled down to clarify his systematic position (1908–10).[1] After the publication of the *Text-Book* (1910) there were rumors among his associates that the (it was already called "the") big systematic treatise, after the Wundtian manner, was to be begun. However, Titchener delayed and wrote *A Beginner's Psychology* (1915), and then in 1917 actually began work on the *magnum opus*. The first volume was never finished. Some of Titchener's younger friends understood that he came presently to the conclusion that a systematic encyclopedic handbook was impracticable, and Titchener himself has told us of Wundt's similar decision of the same question.[2] On the other hand, Weld implies in his preface to the present volume that the larger project had not been completely abandoned; and it is possible that Titchener

[1] *Elementary Psychology of Feeling and Attention*, 1908; *Experimental Psychology of the Thought-Processes*, 1909; *Text-Book of Psychology*, 1910.
[2] *Amer. J. Psychol.*, 1921, 32, 173.

never made a formal decision, but allowed the matter to wait upon the completion of the volume of *Prolegomena*.

The present posthumous volume consists of an introduction and three chapters. A final chapter on Method was never written. The first writing was accomplished in 1917–19. There was some revision as late as 1923. Probably Titchener's health inhibited him later, and he died in the summer of 1927 before he could carry out his intention of writing the last chapter.

The Introduction to the *Prolegomena* was printed in 1921. Chapters I and II are entirely new matter. Most of Chapter III, the longest, was published in 1921–22, but it contains ten initial pages and eleven final pages that are new. Altogether, of the 250 pages of the text, 128 are new and 122 are reprinted. Yet Weld seems to the present reviewer to be right in thinking that the old material gains a new perspective in the present context. Before, this old material was little more than a secondary source for the views of other men and for facts about them. Now it snaps into relation with Titchener's general systematic views and becomes in part a key to the understanding of his method.

The Introduction to this book is called "Brentano and Wundt: Empirical and Experimental Psychology."[3] This antithesis has been criticized,[4] though of course Titchener did not mean that experiment is not empirical, but that empirical psychology, thus named, is not experimental.[5] Philosophy tends nowadays to be empirical, and Brentano's method was the argumentative, empirical, nonexperimental method of the philosopher. Hence Titchener set the stage for his scientific psychology by exhibiting the contrast between Wundt and Brentano. He meant of course to bring the reader ultimately toward Wundt's position and away from Brentano's, but he left the choice between the two systems for the future. He ended the Introduction: "But Brentano also speaks of a 'science' of psychology. Which of the two authors is the right?"

Since this Introduction has been available to psychologists for nearly a decade, we can turn at once to the new matter of Chapter I. This chapter deals with the general "conception of science at large," and is the most original of the three chapters. There is in it a minimum of the citation and criticism of the views of other men,

[3] First published in *Amer. J. Psychol.*, 1921, **32**, 108–120.
[4] L. Carmichael, *Amer. J. Psychol.*, 1926, **37**, 521–527.
[5] Titchener, *J. Gen. Psychol.*, 1928, **1**, 176f.

which make up the bulk of the other two chapters. Instead, Titchener marshals vassals of his own choosing to pursue the argument up to the point where it becomes evident that a science is determined by its *point of view.*

He begins by saying that he is not seeking a logical definition of science. Philosophers have attempted formal definition, and they have, he thinks, all failed because they have not known science from the inside. What is needed rather is the scientific man's own conception of the science in which he works. This conception—we follow the thought of the chapter—can be got at in three ways: (1) One may consider the nature of the activity of actual scientific persons, thus seeing science in the concrete and the particular. This approach Titchener rejects, since individuals vary as to temperament and inclination, and no few men are entitled to represent science and to fix its nature by their own peculiarities. (2) One may, however, reject this approach to the conception of science, and still accept the method of delineating the "man of science" *qua* scientist, the abstracted, generalized scientist, the "perfect" scientist, as it were. This course Titchener adopts and follows throughout the first half of the chapter. (3) Besides this personal, individualized abstraction, there remains, however, science at large within civilization, "institutional science," which transcends the activities of the scientists who contributed to it, and yet plainly has its larger modes of operation. To institutional science Titchener devotes the latter half of the chapter.

The abstract man of science is characterized by his possession of the "scientific temper," and the *scientific temper* is described on its negative side by the adjectives "disinterested" and "impersonal." Thus this man of science differs considerably from men of science in actuality, for "he does not chiefly value the things that men ordinarily care for; . . . he puts away reverence for antiquity, pleasure in the esteem of colleagues; . . . he lacks all desire for fame; he holds back his discoveries and shrinks from any sort of personal discussion." A positive account of the scientific temper is, however, more difficult to give. The man of science, Titchener thinks, tends principally "to identify himself with his subject-matter, to lose himself in it, to become one with it." He can find no better word for this state than "observance," which for him "suggests something of the reverence for fact, sympathy with fact, loss of self in fact," that characterizes the scientific temper. In all this Titchener is trying to stress observation as the very heart of all scientific activity,

and to turn his reader, if not toward Wundt, at least away from Brentano.

In the course of this argument Titchener emphasizes the point that the fact-minded man of science has no shred of interest in the *interpretation* or the meaning of his "observance," that he asks always the question "what?" but never "why?" or "how?" So again it is quite clear that the abstract man of science is very different from an actual living scientist. For this view Titchener found very little support from other writers. However, he did not expect support. In the first place, he must have believed that he had got hold of a crucial truth and that it was his duty to lead. In the second place, he presently returns to this point in a way that makes the position seem less extreme.

It is plain from what has been said that the *method of science* is *observation*. Observation is almost too simple to be defined. It is "sympathetic awareness," "direct acquaintance with." (It is not "knowledge about," for that implies interpretation.) Observation requires the scientific temper and also scientific training.

Thus *experiment* does not stand on its own feet as the method of science, although it has usually been so described. Experiment is the plan of observation. It involves repetition, isolation, and variation. Repetition, Titchener thinks, is necessary for completeness since not all of the whole is seen at once. Variation leads, as Mill showed, to generalized relationships. The reviewer does not think that Titchener has quite done his duty by experiment, for it is plain that repetition is necessary in experiment, not so much for the sake of gaining completeness piece-meal, as for the sake of ascertaining that all the essential relations have been observed, and that variation is the logical method for establishing functional relationships. The discussion of experiment could well have been placed under the section on "applied logic" instead of as a transition to it. In Titchener's exposition it looks as if scientific activity involved three terms, observation, experiment, and applied logic; whereas the middle term could properly have been subsumed under the last.

At any rate, Titchener passes on to the statement that an *applied logic* is essential to scientific activity. It is here in science that interpretation, the answer to the question "why?" in terms of the statement "because," enters in. Interpretation in this sense is necessary to system and to hypothesis and theory. It is "knowledge about," and it belongs in scientific activity as much as does the "acquaintance with" of observation. The two are coördinate, but Titchener insists

upon the dichotomy. He even suggests that a scientist might undertake only to observe with a logician to apply the logic to his observations! However, this division of labor is not what actually happens, and here Titchener presents a portrait of Darwin, as a dual personality, nicely balancing observation against logic. To the question of the validity of this sort of analysis we shall return later.

Titchener now turns to the broader field of *institutional science*. Its main task is to transform "acquaintance-with" into "knowledge-about," and the method at this more general level is called *description*. Description, like observation, does not deal with means, or end, or cause, or force, because these terms all imply the existence of a something that transcends the mere given of phenomena. Description as a method is analysis and synthesis. Analysis may be divisive, abstractive, or relational. Synthesis may yield classification, law of facts, or law of correlation. Analysis and synthesis together make up the one totality of description, which is, therefore, no more analytical than synthetic. The object of description is economy of thought without the distortion of observation. There is nothing new here, unless it is the indication that Titchener's psychology, when in his own words, cannot be the system about which *Gesatlt* psychology is complaining.

Chapter II is called "The Definition of Psychology: Point of View." It begins with a discussion of the definition of the two other fundamental sciences, physics and biology, by point of view; it turns then to psychology at much greater length; it draws a conclusion; and it ends with an 'appendix' on biology and the relation of the three principal sciences. The method throughout is that of a critical review of sources. The method cannot be called an appeal to authority, because Titchener buttonholes the great, as it were, asks his questions of them, and then proceeds at leisure to demolish their answers. For all this formal parade of well known names, one ends with the conclusion that Titchener has no more respect for authority than did Socrates. It will not take us long to review this process.

For physics Titchener appeals to Lord Kelvin, citing the *Treatise* of Thompson and Tait, and he comes, after three pages, to the conclusion that "the definitions of the *Treatise* are, to be sure, obviously incorrect but they serve, nevertheless, to get the chapter started. Nothing further is required by a science whose self-sufficiency makes it indifferent to external criticism." For biology he picks out J. A. Thomson, and concludes after four pages that Thomson gives "a respectable working formula," which is spoiled by the fact that "the

author's logic appears to have been adapted to his controversial purposes."

For psychology Titchener begins, of course, with Wundt, and expounds his doctrine with a clarity and thoroughness of documentation that only Titchener's erudition could command in this field. However, he does not like Wundt's conclusion that physics deals with mediate experience and psychology with immediate experience, because it makes physics appear to be entirely artificial, and psychology much too simple. Moreover, he objects to Wundt's definition of biology as teleological. There are sixteen pages of Wundt. Next comes Avenarius with his definition of psychology as experience dependent upon the individual or the "System C." This is a clear and favorable exposition, for Titchener is going presently to approve of Avenarius' view. Then comes Mach. Titchener's admiration for Mach is known, but here he deserts him for Avenarius, approving of his views in so far as they are like Avenarius' and disapproving his definition of biology. Next Ward, in whom Titchener finds the germ of Avenarius' truth unduly obscured. After Ward, Külpe, who undertook to apply Avenarius' formula to psychology, and failed, Titchener thinks, by not understanding Avenarius. Then Ebbinghaus, whom Titchener finds muddled. Finally James, who came round at last to the definition by point of view, although his definition of psychology in the *Principles* is wrong. Perhaps these summary statements, for forty-six pages of careful research and exposition are not fair, and yet it does seem as if Titchener had called upon Baal and he had not answered—or at most had sent but a faint mist when Titchener had wanted a cloudburst. Well, the upshot of the whole matter is that Avenarius is right (as we knew all along, having read the story before) and that "psychology is the science of existential experience regarded as functionally or logically dependent upon the nervous system."

This second chapter ends with a discussion of biology, citing L. J. Henderson. Here Titchener comes to the conclusion that the environment plays the rôle of the independent term in the formula for biology that the nervous system plays in the formula for psychology. "Biology is the science of existential experience regarded as functionally or logically dependent upon the physical environment." He gives the three formulas for psychology, biology, and physics together (p. 142).

The third chapter of Titchener's *Prolegomena* is called "The Definition of Psychology: Subject-Matter." Its 124 pages constitute

about half of the entire book. Most of it, however, has been published before. In fact, Weld tells us that Titchener had the intention of letting this earlier publication stand without repetition, deleting from the book the long expository and critical sections on functional psychology and act psychology, and rewriting the chapter. However, the rewriting was never accomplished.

The purpose of this chapter is to examine the definition of psychology by subject matter. Titchener begins in newly published introductory sections with the clearing away of the current definition of psychology by illustrations, by the distinction of mind as "inner" and matter as "outer," and by the Cartesian dichotomy (that Bain used) of mind as nonextended and matter as extended. The sophisticated reader will not need to have the objections to these views explained to him. They were as unacceptable to Titchener as they would be to any modern epistemologist.

There then follows the long critique of American functional psychology, with Ladd (not Angell or Dewey) as the theme.[6] After it comes the similar account of act psychology in Austria and Germany, with the views of Brentano, Stumpf, Lipps, Husserl, Messer, Witasek, and Stout making up the content.[7] Both parts of the chapter are remarkably tolerant, sympathetic investigations of the views of others, conducted with Titchener's characteristic thoroughness. Titchener once told some of his friends that he spent an entire year "on Husserl," only to find out that there was "nothing in him." The section on the Germans has long been the standard secondary source in English for these authors. It is, however, a foregone conclusion that Titchener does not find for his present purposes, in either functional or act psychology, the definition by subject-matter for which he is looking.

In the last eleven pages of the chapter and of the book we get, however, what we have been waiting for all along, Titchener's own constructive thought. Here he returns to the problem of the three principal sciences and the possibility of defining them in terms of subject-matter. He is anything but dogmatic and doubts if his question is ready for final solution. Nevertheless, after a careful discussion of terms, he tentatively presents the following table:

[6] Cf. *Amer. J. Psychol.*, 1921, **32**, 519–542.
[7] Cf. *ibid.*, 1922, **33**, 43–83.

"Subject-Matter of	Formal [8]	Material [8]
"Physics	Universal	Energetic
"Biology	Individuate	Behavioural
"Psychology	Systemic	Sensory"

The table might well be inverted, since there is in it an order of dependence from below upward. In psychology experience is regarded as dependent upon the biological nervous system; in biology experience is regarded as dependent upon the physical environment. The form of psychology is *systemic* because it is organized in respect of an organic system, actually the nervous system or its biological equivalent. The form of biology is *individuate* because here the unit is the individual in relation to its environment. The form of physics is, of course, *universal* because it exhibits no such limiting principle of organization. In material the subject-matter of psychology is *sensory* in so far as this adjective describes the nature of sensations, images, feelings, and all other conscious processes. The corresponding adjective for biology is *behavioral*, since behavior is the general term that covers the relation of the organism to its environment. In physics, where the subject matter is universal, the formal term is *energetic*, since it is in terms of energy that the organization of physical science is accomplished.

If there is any important criticism of Titchener's systematic method to be made, it will appear in the examination of his general procedure in the sort of discussion that this book represents. Three things stand out in the reviewer's mind:

(1) The first concerns his analytical method. It has been claimed—unfairly some say—that Titchener is an 'atomist' in his psychology. Be that as it may, he certainly is an 'atomist' in his argumentative procedure. Take, for example, his analysis of the method of science into observation and applied logic. Of course the scientific method has both an observational and a logical aspect, but Titchener does not call these two, 'aspects.' He cuts them clean apart, so that he can dwell upon observation alone. He suggests that observation and the application of logic might even be the activities of different men. He is emphatic in denying the propriety of applied

[8] Through a printer's error, which Professor Weld has ruefully pointed out to the reviewer, the words "Formal" and "Material" have been interchanged in the headings to the table, although the use in the text is clear The table is printed correctly here, but Weld has no occasion to be rueful. for several readers have as yet failed to find any other typographical errors in the entire book.

logic when he is discussing observation. When ultimately he performs his resynthesis of the two, he gets only an *Und-Verbindung*. Everyone who has introspected upon introspection knows that the applied logic is carried in the *Aufgabe* and gets down to the very roots of observation. Of course, Titchener could say that he was not talking about actual observation, but the ideal observation of the abstracted man of science. However, this abstraction is also too unreal to mean much for the scientist, and the reviewer at least cannot see what good is to come from an abstract observation so unlike any observation that ever occurs. The separation of the ideal man of science from the actual man of science is a similar analysis, and here we are brought into the opposite difficulty, in that Titchener does not keep the two entities distinct. In one place (pp. 30f.) he says of this ideal man of science, "if he is a Copernicus," "if he is a Newton," "if he is a Huxley," adding what he would do if he were one or another of these men. Copernicus and Newton and Huxley were free to approximate the abstract man of science as well as they could, but the abstract ideal is not free to model himself on a mere human pattern. It is hard to be sure in these passages that Titchener seriously intends an abstraction from actuality, and yet, if he does not, the validity of the separation of observation from applied logic fails.

In general, in Chapter I the reader feels as if he were transported to a strange world, where everything is new and everything distinctly different. The man of science, institutional science, observation, experiment, applied logic, description, and even analysis and synthesis stand out as separate independent entities, each to be discussed and described without relation to the others. After they have every one been separately encrusted with meanings, it is not possible for even Titchener to make them stick together into a single organic whole. The method has polemical advantages that make it possible to emphasize the importance of one factor without stressing the others, but it does not seem to yield a true picture of the whole.

(2) The second point has to do with a matter that is both a virtue and a defect of Titchener's writing. Titchener was, as he wanted to be, a man of science concerned with observation. Nevertheless in most of his writing he is engaged, not with matters of fact, but with matters of opinion. The essence of the scientific temper is humility, and 'observance' of the given without egoistic interpretation. Such a method is not, however, fitted for the realm of opinion. Titchener, the scientist, did not wish to construct ideas as philosophers do; he

wished to find them as scientists find the givens. Thus in the humility of 'observance' he seeks the views of others and laboriously lives with them and describes them; then with the egotism of logic he criticizes them and rejects them. This course is a misapplication of the method of science to the realm of opinion, and it results twice in this book in an elaborate and lengthy examination of the systematic views of the competent with the resultant discovery that all the work was to very little purpose as regards the main thesis. However, one good result is achieved. The reader finds an invaluable mine of information, even though he has to climb out of it again before he proceeds on his way.

(3) The last point raises the question as to whether there is any better method of dealing with systematic issues than the philosopher's. Titchener excommunicates the philosophers because they do not know science at first hand and thus cannot deal sympathetically with its problems. He wants the scientists to settle these matters for themselves. He finds, however, no great physicist or biologist, except perhaps Henderson, who satisfies him. He goes in vain to the greatest names in psychology for a definition of psychology, and turns away to Avenarius, the philosopher. It is not clear whether Titchener thinks that there is something intermediate between the *a priori* method of philosophy and the *a posteriori* method of science, which the scientist might use, or whether he merely believes that the scientist should be his own philosopher. Certainly all the general systematic matters about definition of science and of psychology, and thus the entire content of this book, are prior to science and psychology and are subject matter for philosophy. Titchener seems to the reviewer to have attempted to bring the scientific method to a philosophical problem and to have met with imperfect success. Only his bitter disappointment with philosophy in relation to psychology could have led him to do this, for he was everywhere else the champion of professional sophistication and expertness. It is true that he never admitted that these systematic problems for psychology are philosophy; but, if they are not, what are they?

EDWIN G. BORING

Harvard University

CHRISTINE LADD-FRANKLIN. *Colour and Colour Theories.* New York: Harcourt, Brace and Company, 1929. Pp. xv+287.

It will be a great satisfaction to psychologists to have available, in the compact form of a fine book, all of the writings of Dr. Ladd-

Franklin on the subject which she has made so definitely her own. The problem of color vision has fascinated keen scientific minds through the centuries: Leonardo, Newton, Young, Helmholtz, Hering, G. E. Müller, and others; but it is not too much to say that the present work, by its firm grasp of the numerous relevant facts, and by its incisive logic, deserves a place even in so distinguished a company. The book brings together, with notes and comments by the author, papers published from 1892 on to 1926. It is chiefly devoted to aggressive but good-tempered argumentation in support of the author's own theory of color vision and against rival theories. Not only the classical theories of Young and Helmholtz and of Hering, but many more recent attempts, are subjected to destructive criticism on the basis of the facts. Though the facts are used as weapons, they are present in such abundance and precision as to make the book a mine for those who are more interested in fact than in theory.

As is well known, Dr. Ladd-Franklin maintains that Helmholtz in his tricolor theory neglected the facts that Hering stressed, and that Hering in his theory of antagonistic colors disregarded the quantitative data established in the Helmholtz laboratory, while neither of them did justice to the psychologically unitary character of all the colors that demand recognition as elements: yellow and blue, true red and green, black and white. She was able, by bringing in photochemical considerations, to indicate a way in which all these facts could be covered by one theory. Moreover, her theory was easily stated in a developmental form. If one value of theory is to hold together a mass of facts, the Ladd-Franklin theory of color vision is remarkable for its success in integrating the facts of direct color impressions, of color mixing, and of rod and cone vision, along with something of photochemistry and of biological evolution.

Whether the theory has also a heuristic value is another question which has sometimes been answered in the negative. The author herself found it of value, years ago, in predicting foveal blindness in total color blindness and in normal twilight vision. Its possible use in suggesting research into the photochemistry of vision has perhaps not been tried out as yet. On the developmental side, it suggests that primitive types of color vision might be found among animals, conforming either to red-green blindness or to total color blindness; and this prediction has already been verified to a certain extent.

Quite recently Hecht has been stimulated in part by the Ladd-Franklin theory to reëxamine the matter of binocular color mixture,

and has found conditions under which a binocular combination of red and green gives the sensation of yellow. This result seems at first thought to invalidate the Ladd-Franklin conception of yellow as the result of chemical combination, probably within the retina, of the red and green cleavage products. But there are so many facts yet to be brought into line with the conception of a purely cortical origin of yellow that we can hardly regard the Ladd-Franklin theory as shattered by this one blow. What does seem probable is that renewed activity is now to be expected in the study of color vision, and that the theory is destined to play its part as a heuristic principle.

One advantage of the Ladd-Franklin theory over that of Hering appears in the treatment of black. Both theories—and the Young-Helmholtz theory as well, in order to be complete—have to assume a cortical response as occurring when and where no stimulation is coming in from the retina. The conception of antagonistic colors requires that black shall correspond to actual stimulation coming in from the retina, and so is forced to postulate a medium gray as its background or cortical color—which postulate forces it into several improbable supplementary hypotheses. The Ladd-Franklin theory is free to select black as the cortical color corresponding to no stimulation from the retina; and this assumption is shown to work out quite neatly.

Mention should be made of the color charts, which are not only beautifully executed, but very carefully managed to present the colors required; and the glossary should not be overlooked, with its definitions and important suggestions of standardized nomenclature.

R. S. WOODWORTH

Columbia University

MURPHY, GARDNER. *An Historical Introduction to Modern Psychology.* New York: Harcourt, Brace, 1929. Pp. xvii+470.

At last, experimental psychologists have a history of psychology which they will undoubtedly enjoy reading. Previous histories have dealt for the most part with the philosophy of mind. Dr. Murphy's desire in writing the book was to give a perspective for contemporary scientific psychology, and his mental set is therefore an experimental one. It is true that the first part deals principally with the work of the seventeenth and eighteenth centuries, but even here he centers upon scientific work, such as that of Cuvier and Bell, which has a bearing upon modern problems of psychology, biology, and

physiology. These chapters, however, are merely inserted to supply the knowledge necessary to an understanding of what is to come. The history is virtually sketched between the frame of the nineteenth and twentieth centuries, and thus begins at the time when progress in biology made possible a relatively sharp division between philosophy and psychology. The events are not recorded in strictly chronological order, nor do the chapter headings seem to fit into a logical scheme. Yet the history develops smoothly and clearly, and there is something refreshing in the freedom from any rigid arrangement.

The second part of the book, which follows the preëxperimental period, covers the ground from Weber to Wundt. Much space, of course, is given to Weber, Müller, Fechner, Helmholtz, and Hering. There is also a lengthy description of the Associationists, the Evolutionists, and the French psychiatrists. Wundt's contributions, and those of his pupils, especially Cattell, are developed in detail.

Part Three deals with various topics of experimentation, except for the chapter on William James, which is introduced dramatically between a chapter on memory and one on functional and structural psychology. Then follow chapters on the thought processes, acquisition of skill, behaviorism, child, social, and religious psychology, psychoanalysis, instincts, intelligence, personality, and physiological psychology. These topical chapters do not always contain what one would expect. One finds under the chapter on personality, for example, descriptions of the classical work on the emotions. For the most part, however, Dr. Murphy has used excellent discrimination in the selection of his material, and these chapters might well serve as models for graduate seminary papers.

At the end of the book, by way of good measure, we are given two chapters on contemporary German psychology by Heinrich Klüver. It is rather illuminating to compare the last pages of Dr. Murphy's contribution with the opening pages by Dr. Klüver. Dr. Murphy extols the development of quantitative method, and states that "it is, perhaps, not entirely fanciful to suggest that as our knowledge and our language becomes more precise, the answer to the question 'how much does it hurt' may be $42xy^3\cos A$." Dr. Klüver writes, "Viewed historically, it seems, at least so far as German psychology is concerned, that the chief trend is towards a qualitative psychology. . . ." Dr. Klüver's last chapter on psychology as a "cultural science" will cause the experimentalist to thank the fates for his laboratory.

One is not always able to agree with Dr. Murphy's interpretations, nor with the emphasis he has placed upon certain facts. For example, to say about Ebbinghaus' quantitative treatment of learning and forgetting that "this was probably the greatest triumph of original genius in experimental psychology since Weber," appears to the reviewer a bit strong. However, it is easy to criticize a history. Dr. Murphy has written his book in a style that makes its reading a pleasure. He seems for the most part enthusiastic over his subject, and the reader is infused with his spirit. He has avoided details, which is a wise procedure in a history of this nature. But, of course, it means that the reader must already have a background of psychology, in order clearly to understand many of the descriptions, especially those concerned with experimentation. The book will probably not have a popular appeal, but it will be appreciated by those persons who have more than a superficial interest in psychology. It will prove invaluable to the advanced student, and will be read with much profit by the instructor.

H. S. LANGFELD

Princeton University

GOLDSTEIN, K., Psychologische Methoden zur Untersuchung der Hautsinne. SCHAEFER, K. L., Psychologische Akustik. *Handbuch der biologischen Arbeitsmethoden,* Abt. VI, Methoden der experimentellen Psychologie, Teil A, Heft 3 (Reine Psychologie). Berlin: Urban and Schwarzenberg, 1922. Pp. 149.

This monograph contains two thoroughgoing reviews, one of them being concerned with the experimental methods, apparatus, and data pertaining to the cutaneous sensory modes and the second giving a similar comprehensive summary of investigations in the auditory field. The author of the first article, K. Goldstein (Frankfort), acknowledges an emphasis on the function of the tactual senses in relation to the whole of the mental life. The method of research in this field must be grounded on expressive movements manifested either by the involuntary reflexes or by voluntary speech. He shows the influence of the principles underlying the psychology of Gestalt in stating that the analysis of cutaneous qualities is misleading because of the proved reciprocal effects among sensations of various orders and because of the fact that a single quality deprived of its simultaneous or even its successive associates can not be regarded as a component part of the total experience. Cutaneous localizations

are affected by visualization of the *locus*. Even specific conditions, such as observation with or without closed eyes, modify the results.

The author goes on to characterize and criticize the various classical procedures, like the method of limits, that involve threshold values, the methods that apply to supraliminal values of intensity, and the method of paired comparisons. He has collected the more important data concerning bodily localization and sensitivity to various orders of stimuli in different parts of the body, and presents detailed tables and diagrams to illustrate these facts.

A separate section develops and systematizes the results of experimental work on the cutaneous qualities of the several orders. Among the more significant treatments rank the data concerning the recently investigated "sensations of vibration." These experiences are apparently not referable only to the periostium, as was once believed, but are reported also in connection with pressure sensations of cutaneous origin. The author believes that they are not new qualitative distinctions but are due to the peculiar manner in which these sensations of pressure are aroused. For clinical purposes, however, the bodily protrusions still lend themselves best to diagnostic analysis. Clinical procedures are further discussed in detail and pathological results are noted.

Thereupon follow drawings and descriptions of standard pieces of apparatus in this field of research, together with critical notations of their peculiar limitations and their special adaptations. A carefully selected bibliography of 134 titles is appended.

The article on psychological acoustics written by K. L. Schaefer (Berlin) is written on an equally high level and is comprehensive in scope. It is especially valuable in its critical discussion of experimental techniques and of methods used in the standardization of apparatus. It begins with a presentation of the main facts concerning the demonstration and the observation of very low tones followed by a similar section on the tones near the upper limit of hearing. There an unusually complete description of the techniques involved in the standardization of the Galton whistle is given—the reviewer has nowhere seen so comprehensive a survey of these important procedures. The next section deals with the lower limen for intensity. Tones of very short duration and the various phenomena surrounding interrupted tones are then rather adequately treated without uncovering much of intricate mathematics and physics. Pitch discrimination is also done on a moderately comprehensive scale. Much of the American work in all of these fields is apparently either unknown or

disregarded. But there is also a really negligent disregard of the important psychological principle that has appeared in our work only in the last decade that pitch discriminations are functionally related to degrees of intensity, so that actually we can no longer speak of "tonalgaps" or "tonal islands."[1] The next section reviews the procedures and results in the field of intensive discrimination of sound. Then comes an account of some of the work on the judgment of intervals. Again while there is much helpful material concerning the classical procedures and the outstanding results, with a critical appraisal of the several methods of attack, there is a dearth of discussion of the experimental work on consonance and dissonance which has come within the chronological scope of the article. The last section summarizes much of the work on sound localization in terms of angular displacement from the ears, and the perception of the distance of sounds. For the size of the entire article, this section is exceptionally well done. It is a subject which brings in new facts each year and some of the classical experiments consequently require reinterpretation. In a field where the accumulated facts demand a separate monograph several times as extensive as the whole of this one, it is easy to point out that there are many investigations, which in the reviewer's mind loom large and which have been omitted in the discussion. The bibliography is not collected at the end but is carried concurrently as footnotes.

As an easily accessible monograph on these two sensory modalities which discusses methodology and apparatus on a moderately high level of constructive and destructive criticism the laboratory technician would do well to welcome this monograph into his library. For the laboratory assistant, who has a fluent command of German, the reviewer knows no better helpmate in the field. The monograph forms one of a complete series on the various subdivisions of experimental and other branches of psychology.

CHRISTIAN A. RUCKMICK

University of Iowa

BAGBY, ENGLISH. *The Psychology of Personality,* an Analysis of Common Emotional Disorders. N. Y.: Holt, 1928. Pp. 236.

The Psychology of Personality is limited to the "study of persistent emotional tendencies," with the emphasis placed upon the

[1] Ruckmick, C. A., Auditory Sensations and Related Phenomena. PSYCHOL. BULL., 1927, 24, 84 ff.

"purely descriptive studies" "of minor disturbances of thinking and conduct." A conservative interpretation of the phenomena studied led to the development of certain "activity levels" and a new theory of adjustment termed the "tension-reduction principle."

"Personality traits" or "emotional complexes" are the persistent characteristics of an individual. These must be developed, or "reduced," or new complexes "conditioned" to replace the old.

Unfortunately the case used to illustrate the introductory explanation of the point of view is a "sex repression" case. However, the author gives a reasonable discussion of the numerous emotional phenomena. Many of these are significant from daily life, for example, "worry."

The concept of "tension" is developed from the relation of "changing internal conditions" and the expenditure of energy. This "condition" is important because it is capable of changing the "intensity of reactions."

The "basal activity level" of the individual is the hereditary background of internal function, while the emotions tend to determine the internal change and so the actual level. The basic problem of adjustment is the necessity of altering the "tension" by the "conditioning" of more adequate "emotions." The reduction of "emotional tension" becomes the main object of treatment in all of the "disturbances" of reaction. The usual psychiatric and psychological treatment of abnormal cases is presented in the form of illustrative material.

A statement of general principles of treatment with its undue emphasis upon "inferior" adjustments of "fear arousing experiences" leaves much to be desired.

In all the author has presented a point of view which perhaps needed fewer pages for statement, but many more for adequate application.

R. A. BROTEMARKLE

University of Pennsylvania

CRAWFORD, A. B. *Incentives to Study*, a Survey of Student Opinion. New Haven: Yale Univ. Press, 1928. Pp. 194.

An analysis of tendencies and motives among College students is made on the basis of an investigation carried out with the assistance of a large number of undergraduates at Yale. It indicates the factors influencing the attitude of college-level student toward the

materials, problems and processes of their education. It aims to understand the motivation of the student's "essential job of study."

The Survey conducted in 1926 was formulated by students and endorsed by the Undergraduate Student Councils. During the two years required for analysis, the interest of the student body crystallized in a separate Report which is presented in the appendix.

Evidence is presented to establish the authenticity of the data secured from approximately half of the undergraduate student body. The author insists that "small but consistent differences properly merit recognition" and "in light of the numerous factors operating may be said to have great significance."

Initial ability or general intelligence, based upon Intelligence Test Standing, is held to be of greatest importance.

Economic factors were investigated in terms of family, home, annual expenses and degree of self-support. Academic success is held to be inversely related to financial "advantage."

Family backgrounds were investigated in terms of "occupation of parents" and "parent's education." "The non-college family groups" present better scholastic risks; while the individuals from "smaller college families" do not do as well as those from "large families," "probably because of the spur of competition."

Occupational Purpose enhances the scholastic application with the greatest effect on the part of the professions as over against the prospective business men.

A coördination of the various findings places the incentives in order as follows from greatest to least: Potential Ability, Life Purpose, Professional Career, Economic Status, Parents' Occupations, Student's Own Purpose in Going to College.

Student Activities maintain a definite influence on "purpose." The investigation was supported largely by the leaders of student activities.

The Curricular Requirements and Electives indicate that there is less value educationally in the former, especially if the requirements are not in the student's major field of study. Intellectual breadth is to be attained through capitalization of the value of purpose.

The author concludes with a statement of the necessity of correcting the curriculum and developing its function in terms of the student's "purpose," and in harmony with his attitudes and interests. Orientation and guidance is required to develop the intellectual purpose of the student in his earlier years, and direct him in his later years of study.

The appendix contains a bibliography of 156 books or articles, the Questionnaire and Time Chart Forms, with procedure, Superiority data and the Special Student Report.

It is not enough to say that the analysis of the survey has sustained the opinions of educators, or in a comprehensive way established the results of former studies. The study points to advanced methods of Student Personnel investigation, with improved educational instruction and guidance. The greatest import of the survey will remain the reasonableness of the "student opinion" and the advisability of administrative use of the same.

R. A. BROTEMARKLE

University of Pennsylvania

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